FINAL REPORT
TRADOC RAM DATA EVALUATION SYSTEM (TRADES)
(ACN 51235)

PART V: SYSTEM TECHNICAL PAPER

APJ 892-5

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AMERICAN POWER JET CO. RIDGEFIELD N.J.

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TRADOC RAM DATA EVALUATION SYSTEM (TRADES)
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PART V: SYSTEM TECHNICAL PAPER

UNDER

CONTRACT NO. DAAK21-81-C-0034

FOR

RAM ENGINEERING AND ASSESSMENT BRANCH
RAM/ILS DIVISION
MATERIEL SYSTEMS DIRECTORATE
U.S. ARMY LOGISTICS CENTER
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The TRADES final report provides an innovative concept for the collection, evaluation, storage, and dissemination of reliability, availability, and maintainability data to satisfy TRADOC requirements. The five part study recommends an automated system that enables the TRADOC combat developer to access RAM information from appropriate data sources. Combat and materiel developers need such a system to utilize and draw maximum actionable inferences from existing and future data bases.

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Part I: Executive Summary. Includes the highlights of the study effort, detailing the background which led to the study, the essential areas of analysis, alternatives developed, study conclusions and recommendations.

Part II: Study Work Plan (SWP). The SWP outlines the objectives of the TRADES concept development, the purpose, assumptions, scope, essential elements of analysis, time schedule, and resources required for the study.

Part III: System Requirements Description (SRD). The SRD presents the functional requirements for the TRADES system developed using basic source documents, questionnaires, and dialogue established with data users, data proponents, and data sources.

Part IV: Alternative Concepts of Operation (ACO). The ACO explains the five ACOs which were developed and includes a comparative evaluation of these alternatives along with the recommendation to use the U.S. Army Logistics Center Planning Factors Data Base (PFDB) mini-computer.

Part V: System Technical Paper (STP). The STP documents the data system concept which includes the overall concept of operation, internal and external procedures, hardware and software requirements, and personnel implications. This report also recommends that TRADES capitalize on the currently available and programmed hardware within TRADOC, which significantly reduces implementation costs and time.

NOTICE

VIEWS, OPINIONS, AND/OR FINDINGS CONTAINED IN THIS REPORT ARE THOSE OF THE AUTHOR(S) AND SHOULD NOT BE CONSTRUED AS AN OFFICIAL DEPARTMENT OF THE ARMY POSITION, POLICY, OR DECISION UNLESS SO DESIGNATED BY OTHER DOCUMENTATION.

FOREWORD

This report entitled "TRADOC RAM Data Evaluation System (TRADES)" is an American Power Jet Company (APJ) study effort issued in five parts:

Part I:	Executive Summary and Brief
Part II:	Study Work Plan
Part III:	System Requirements Description
Part IV:	Alternative Concepts of Operation
Part V:	System Technical Paper (This Report)

This Part of the final report documents the data system concept which includes the overall concept of operation, internal and external procedures, hardware and software requirements, and personnel implications. The report also recommends that TRADES capitalize on the currently available and programmed hardware within TRADOC, which significantly reduces implementation costs and time.

A draft version was submitted as APJ 892-4, and presented to the SAG. Their comments and recommendations are incorporated herein and are gratefully acknowledged.

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CHAPTER I

INTRODUCTION

SYSTEM TITLE

This study is entitled the "TRADOC RAM Data Evaluation System (TRADES) (ACN 51235): Phase II." References made to the acronym "TRADES" throughout this report will refer to the TRADOC RAM Data Evaluation System and not to the present study.

SUBJECT OF THIS REPORT

This specific report is called the "System Technical Paper (STP)," and accomplishes the fourth task in the TRADES concept development study being performed by the American Power Jet Company (APJ) for the U.S. Army Logistics Center. The three previous reports respectively covered the topics of the Study Work Plan (SWP), the System Requirements Description (SRD), and the Alternative Concepts of Operation (ACO). This STP report will be followed by the Final Study Report (FSR) which will include all of the previous reports. A more detailed description of each task is provided in the SWP.

BACKGROUND

The need for TRADES has evolved due to the ever-increasing complexity of weapons systems and the need for the combat developer to establish standards to ensure that these expensive systems will work when fielded. Realistic RAM parameters and thresholds must be prescribed which are based on user needs for system effectiveness and logistics supportability in view of system design, state-of-the-art technology, and performance achieved by fielded equipment. Great care must be taken in establishing RAM requirements because of their significant effect on development and operating and support costs, and on equipment readiness.

TRADES is envisioned as an information system which would provide the TRADOC combat developer with responsive near real-time automated reliability, availability, and maintainability (RAM) information. This would include engineering, test, and field data, and is designed to provide the capability to support requirements determination and test analyses for materiel under development. A complete summary of TRADES and its background is included in the SRD.

PHASES

The TRADES study effort has three phases: Phase I established the requirement for a TRADES system; Phase II (the current phase) in essence portrays the concept for an operational TRADES; Phase III, if approved, will address the implementation of TRADES as an operating system for the TRADOC community. It should also be noted that although the system is being developed for TRADOC, other potential users in the Army have been identified.

PURPOSE OF THE STP

The purpose of the STP is to develop and document a data system for the alternative concept of operation using the Planning Factors Data Base (PFDB). The PFDB ACO was selected from among five alternative courses of action, and is used as the framework on which to base the TRADES concept. Whereas the ACO report provided sufficient information for comparative judgments, the STP focuses on the selected system and expands on its operation, characteristics, features, required resources, and the next steps for implementation of TRADES. This paper will include the overall concept of operation, internal and external operating characteristics, hardware and software requirements, and personnel implications as prescribed by the SOW and further guidance from the SAG.

SCOPE AND SUMMARY OF CHAPTERS

The PFDB ACO was conceptually developed and briefed to the SAG on 24-25 August 1981. This report, therefore, describes in greater detail the relevant features and resources required for the TRADES system.

Chapter I (Introduction) provides the background to TRADES and to this report.

Chapter II (Methodology) describes the methodology used in the preparation of the STP. It includes a description of the methods used to access data, process and analyze information, and to record the results of these investigations. References, agencies and individuals consulted are also listed.

Chapter III (Concept of Operation) provides an overview of the TRADES concept of operation using the PFDB alternative. The concept also treats the

specific objectives of the system and describes the type and volume of the data base contents. Formats of reports, sources of information, storage requirements, and interfaces between users, data sources, and automated systems are detailed. It is noted tnat the SOW originally entitled this chapter as the Concept of Automation. However, the SAG provided the guidance that the broader concept of operation should be included in this chapter with the details of automation covered in subsequent chapters.

Chapter IV (Internal Operating Characteristics) describes the appropriate techniques for data retrieval, processing, and dissemination in narrative form. Flow charts are provided which form a basis for functional understanding of the system, and are sufficiently detailed to permit definition and design. This chapter also describes procedures for acquiring, verifying, and storing data. (Definition, design, and programming activities for TRADES will occur in the later life cycle stages of TRADES).

Chapter V (External Operating Procedures) provides a detailed description of the procedures by which the user can obtain the required products from TRADES. It provides an estimate of the frequency and volume of data requirements for each prospective user. This chapter also discusses the TRADES organization required to acquire data, maintain the system, and service the users.

Chapter VI (Hardware Requirements) reviews the hardware characteristics of the PFDB alternative and details the requirements and modifications necessary to incorporate TRADES. Attention is given to peripheral equipment, remote terminals, access/storage devices, output equipment, and communications equipment needs.

Chapter VII (Software Requirements) addresses the Data Base Management System (DBMS) and describes each of the four modules which perform the TRADES functions. Consideration is given to the expected computer capabilities, requirements for TRADES, and realistic expectations for state-of-the-art improvement in software development.

Chapter VIII (Personnel Requirements) provides a functional identification of the personnel required to operate and maintain the TRADES system. This includes a description of actions at user level as well as for data sources, functional proponents, and ADP proponent.

Chapter IX (Conclusions) provides a summary of the study, stressing TRADES implications and subject issues, hardware, software, and personnel requirements. Benefits and problem areas are emphasized and the potential increased productivity of the user is weighed against technical risks involved in the development of TRADES.

Chapter X (Recommendations) specifies further actions needed to implement TRADES. These include comment on inoperative data accumulations and prototyping activities to support the parallel development of TRADES under the provisions of AR 18-1.

Certain flow diagrams and descriptions previously presented in the aforementioned reports are used directly in this report to maintain continuity and avoid the need for excessive cross referencing.

CHAPTER II

METHODOLOGY

PURPOSE

This chapter contains methodological notes and explains the procedures used for the preparation of the STP. This portion of the task of TRADES concept development is best characterized as the emerging concept of TRADES.

As originally conceived, the STP was to be a recapitulation of the ACO selected for the development of TRADES. The process identifies the needs of the user and sources of information from the SRD, and applies them to the ACO selected for TRADES. The actual developmental process of TRADES has proven to be a dynamic one, with processes and procedures of the TRADES concept interactively modified during each task and SAG review session.

PROCESS

The evaluation process entails observation and analysis of existing procedures, and the conversion of those processes to a more efficient compatible method using automation.

TRADES, however, initiates a new process and involves basic investigation of several systems not yet fully in being or fully standardized. Therefore, the analyst is in fact planning a concept with the requirement that all systems with which TRADES will interface will in fact be able to provide the desired information and implies the development of essential interfaces.

FUNCTIONAL DESCRIPTION

Understanding this point has mandated the review of the concept of operation of TRADES at each major step; in the development process, it is continuously updated as the finer grain of TRADES is refined in each development phase. As will be noted in the Recommendation Chapter, the development of a Functional Description (FD), as required by DoD Standard 7935.1-5, Automated Data Systems Documentation Standards, should be initiated as early as possible. The FD is defined in the DoD Standard as follows:

"An FD (Functional Description) is normally prepared for any system requiring a basis for mutual understanding between the Development Group and the User Group of a proposed ADS. It reflects the definition of the system requirements and provides the ultimate users with a clear statement of the operational capability to be developed. If the scope of the FD is changed at any point, the FD should be updated and receive user concurrence."

"The FD is a tool for use by both computer and noncomputer personnel and should be written as much as possible in noncomputer-oriented language, since many elements of the document will be subject to review by staff personnel who do not necessarily have a computer background."

The FD then is essentially a living document that reflects the concept of operations and forms a basis of understanding between the user and the personnel designing the TRADES system.

ANALYSIS

Source Information

One of the conclusions of the SRD was the plethora of source information. In fact, this varied complexity of data is precisely a major reason for the need for TRADES, which facilitates the ability of TRADOC RAM engineers to obtain RAM performance data for the combat development process.

To form a baseline for development of TRADES for full implementation in 1985, it was necessary to focus on the major source systems which are planned for operations in that period of time (Table 2-1). The TRADES system will be built around these primary systems with the other sources of data interfacing on an "as required" basis.

TABLE 2-1. PRINCIPAL LIFE CYCLE PHASE DATA SOURCES

DEMONSTRATION AND VALIDATION	FULL SCALE ENGINEERING DEVELOPMENT	PRODUCTION AND DEPLOYMENT
Logistics Support Analysis Report (LSAR)	LSAR	Standard Army Maintenance System (SAMS)
Common RAM System (COMRAM)	COMRAM	Sample Data Collection (SDC)
Common Test Data Collection System (CTDCS)	CTDCS	
TRADOC System*	TRADOC System*	
Defense Technical Info. System (DTIC)	DTIC	

* Hard copy and local automated data developed by TRADOC test boards

User Orientation

One of the principal lessons learned from the SAG guidance is the need for TRADES to be focused on the user's needs; i.e., the TRADOC schools and centers. To determine the marginal cost difference among the ACOs, a constant requirement was assumed at the schools and TRADOC System Managers (TSMs) and therefore did not feature the TRADES total system costs. The STP places the focus on the TRADES user resource requirements derived from input by the SAG members and reflects the entire system resource requirements.

Also, the question of distributed versus centralized processing was further analyzed. It should be reemphasized that the central features of TRADES places the updating responsibilities on one organization, with control of selected input by proponents. This concept permits users to utilize computers available at their home station (rather than just basic terminals) to process RAM information as desired by that activity. The "sunk cost" feature of using the centralized in-being computers is an essential element of the TRADES concept.

Hardware Assumptions

In order to ensure a high level of confidence in the envisioned mini-computer capabilities and requirements estimates, actual equipment assumptions were made. These are detailed at appropriate places in the STP. These representations are made to facilitate comparisons and analysis, and are not to be construed as a statement of need for any particular make and model of automatic data processing (ADP) equipment. The computers currently located at the (DPFO) in Fort Leavenworth, Kansas, and Operations Analysis Directorate (OAD) at Fort Lee, Virginia, are assumed for the STP purposes only and will not restrict changes which may be made by the Army in the follow-on phases. System design at this stage is not dependent on any particular type of computer and is constrained only by size and capability limitations.

The primary advantages of the centralized system must be considered and evaluated in contrast to a totally decentralized system. While the TRADES system recognizes and acknowledges micro-computer capabilities at user level, this is recommended as an enhancement and follow-on after the initial use of currently existing and available equipment.

The most important aspect retained, however, is centralized programming of the overall TRADES system to achieve a uniformity of available data and procedures for consistent application and comprehension of results.

The primary advantages of a totally decentralized TRADES are the avoidance of any potential queueing problem and the ability to operate on an individual initiative basis. The disadvantages include potential unique development of information, lack of uniformity and discipline, and a de facto need for personnel to operate and manage the system with no economy of scale.

Our conclusion is that the partially distributed concept of TRADES permits local expansion where the talents and requirements make this a logical development. However, the bulk of the TRADES users are not anticipated to have the requirement for this capability, which will be available in the centralized TRADES system.

TRADES Life Cycle Overview

Although TRADES will not likely require DA level approval (developmental costs are anticipated to be less then $3M), AR 18-1 functions as an umbrella over all Army automation management. Therefore, the provisions of this regulation must be recognized, and recommendations for TRADES are within the parameters of this regulation.

In accordance with AR 18-1 and TB 18-100, TRADES life cycle is comprised of five major phases in relationship to the management milestones. (See Figure 2-1).

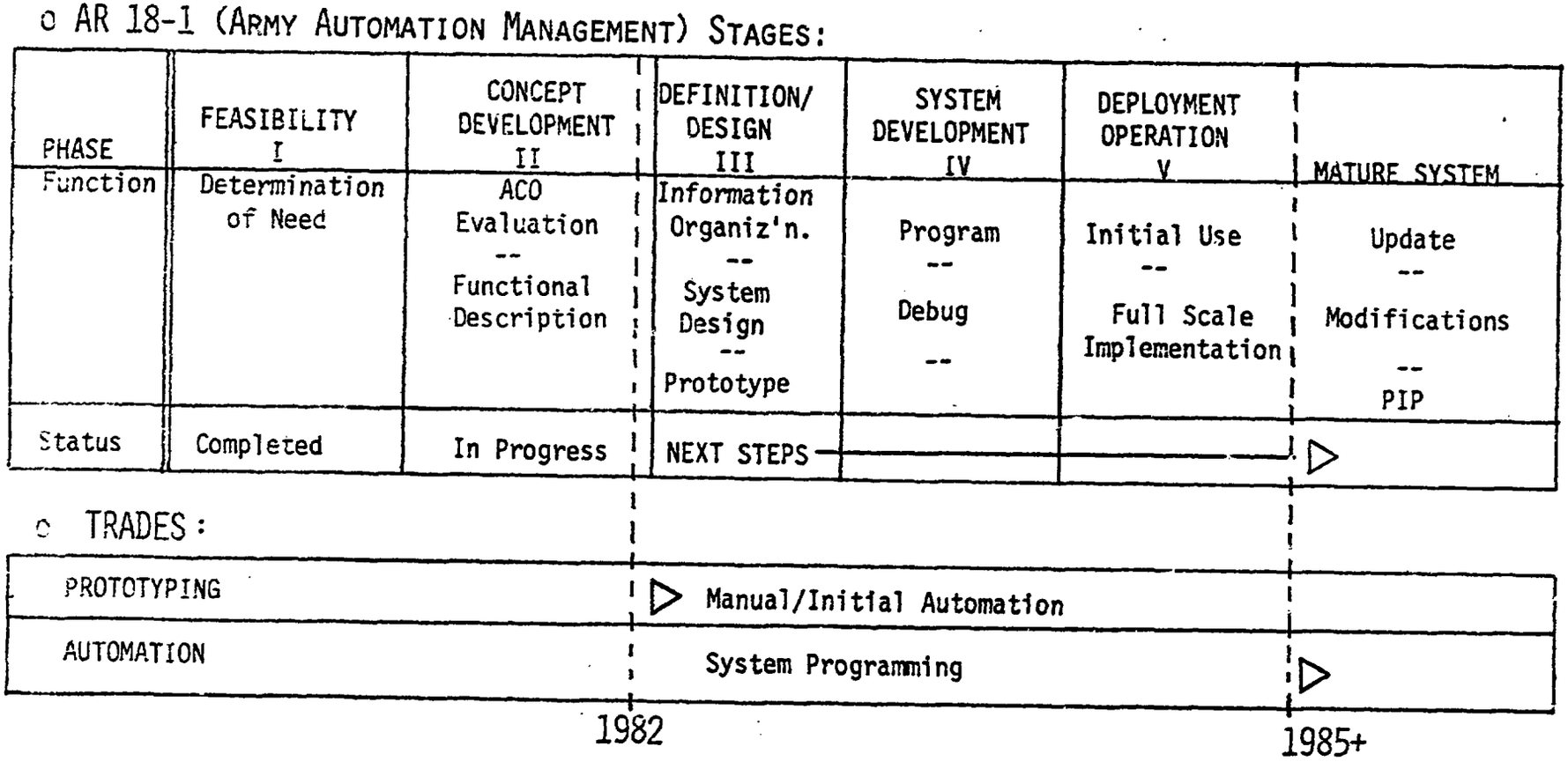
TRADES is being developed at a time when Automated Data Systems (ADS) developmental procedures are changing. Because of this, TRADES concept actions do not parallel those actions now required for the development cycle of ADS. However, current regulations are flexible enough to permit modifications of standards to the size and requirements of whatever system is being developed. It seems that it would be good judgment to re-align the TRADES development cycle on the milestone and phases currently being used. Para. 1-8, b, (7) (d) of TB 18-100, Army Automation, 15 Dec 80, requires initial functional requirements using documentation in TB 18-111. In addressing documentation requirements, Para. 2-5 a of TB 18-111, Army Automation Technical Documentation, Jan 1979, states that DOD Standard 7935.1-5 is to be followed using the Functional Description. It is imperative that the functional description be initiated, as discussed in Chapter II of the STP.

Other Actions

Actions should be taken to bring the development of TRADES into line with the requirements of these regulations. These actions are detailed in Chapter X (Recommendations).

Phase II

As shown in Figure 2-1, Phase I (Feasibility Study) has been completed. TRADES is now in concept development with the present effort developing the final concept (corresponding to Milestone I), with the description presented in the STP.



Note: Prototyping gains 3 to 4 years

Figure 2-1. TRADES Life Cycle Overview

Phase III

The next phase of the work program will concern the definition and design of the accepted TRADES system prior to Milestone II. A major initial effort in Phase III will be the organization of the data base, and development of the appropriate taxonomy to facilitate RAM data searches and provide for efficient and effective categorization of the data base. The organization of the data base and development of the taxonomy will provide major inputs to the actual design of the system to complete Phase III.

An inherent characteristic required of TRADES is that it be capable of being prototyped and permit its evolution in the direction of maximum customer service. This infers that RAM data is not a "once and for all" requirement set by current RAM requirements documents or users, or indeed by the present users' view of what they need. These, to the contrary, are only starting points.

This prototyping in Phase III could address a single data source as an initiation point for debugging the system, and then progress into full-scale implementation of total RAM data sources in Phase IV.

Phase IV

Phase IV consists of the TRADES system development, with the major effort in programming and debugging the system prior to Milestone III.

Training

Once TRADES is operational, it must respond to changes and needs of the user community, as well as to increasing availability of RAM data at any point in its life cycle. The team must determine weak spots in the source data and use the TRADES system to secure action in areas of maximum return. This implies a highly competent TRADES management team, comprised of human beings using the computer as only one of their tools in meeting their missions and functions.

CHARACTERIZATION OF TRADES

It must be emphasized that TRADES is not primarily a data base, but a system to facilitate the extraction and manipulation of data from other data systems. Information derived from calculations as well as reports, once extracted, are included within TRADES to facilitate rapid future access.

IMPLEMENTATION

The STP represents the best estimate of these synergistic processes and their effects on the concept of operation. The result is a system which we believe represents a flexible and viable concept for TRADES.

The PFDB interrelationship with TRADES will facilitate the accomplishment of TRADES development, and provide for the systematic operation of the system. The nature of the PFDB concept is further explained and documented in the Concept of Operation. Since the PFDB implementation is proceeding on schedule, TRADES may readily be incorporated as an acceptable portion of the PFDB with no problems foreseen at this time.

CHAPTER III

CONCEPT OF OPERATION

SYSTEM DESCRIPTION

TRADES is a partially distributed data processing system that uses a mini-computer located at the U.S. Army Logistics Center and a backup mainframe computer at the TRADOC DPFO. Remote access interactive terminals and micro-computers are located at TRADOC materiel combat development activities. TRADES will be centrally managed and will provide interactive access to automated sources of RAM data as well as internal information and data manipulation capabilities on an as-required basis. The overall concept of TRADES is shown in Figure 3-1.

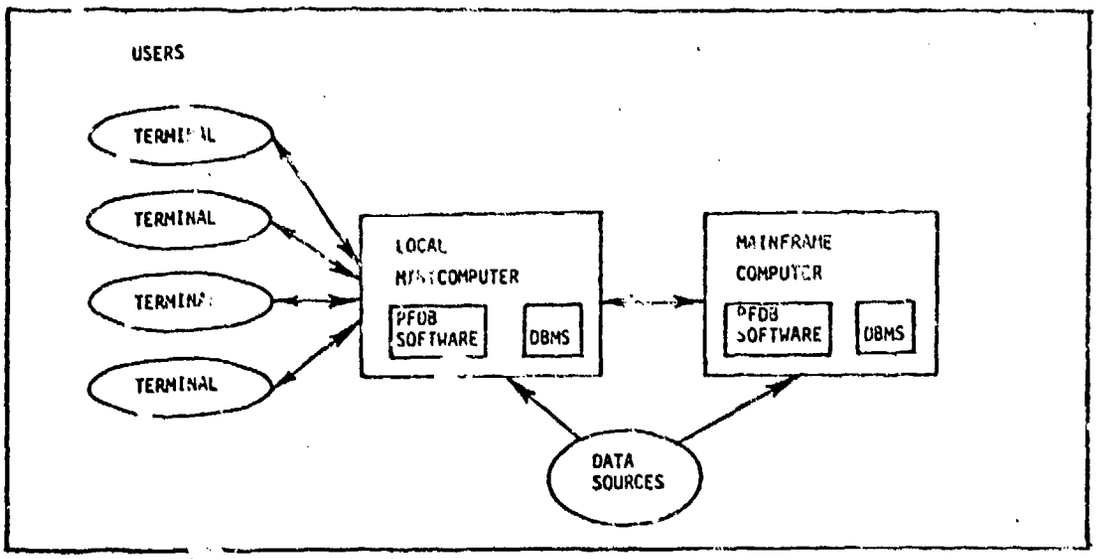


Figure 3-1. Generalized Concept of TRADES

PURPOSE OF TRADES

The purpose of TRADES is to support the TRADOC combat developers in their RAM responsibilities. These specific responsibilities are assigned by the Department of the Army in draft DA Reg. 702-3 as follows:

1. Establish and maintain controls to insure effective coordination of RAM program functions and compliance with AR 702-3.

2. Determine, in coordination with the materiel developer, realistic RAM requirements consistent with system operational and support concepts, current technology, Army doctrine, organization and force structure, and the Cost and Operational Effectiveness Analysis (COEA).

3. Monitor materiel development and assess how well the system has met RAM requirements as demonstrated during development test (DT) and operational test (OT).

4. Establish liaison with materiel developers to assist with exchange of RAM data needed to develop requirements for emerging systems.

5. Maintain a central activity for the proper statement and justification of RAM characteristics in materiel requirements documents.

6. Develop and keep abreast of current progress in RAM methodology as applied to combat developments.

7. Conduct OT on assigned items of materiel to assess RAM and provide RAM OT portion of coordinated test program (CTP).

8. Review requests for RAM waivers for non-developmental items and recommend approval to DCSRDA, when appropriate.

9. Provide RAM training for combat developers. TRADES will facilitate RAM training by providing materials which can be used by the developers of the RAM Course.

GENERAL OBJECTIVES OF TRADES

These functions imply responsibilities in the entire life cycle process, including development, procurement, operations and support. The following are general objectives of TRADES:

1. Support the preparation of requirement documents, such as Letters of Agreement (LOA), Required Operational Capability (ROC), Letter Requirement (LR), and Training Device Letter Requirements (TDLR).

2. Assist monitorship of development and acquisition actions.

3. Support RAM related activities for test planning, test reports and participation in test review and analysis actions.

4. Assist in preparation for decision briefings such as the In Process Reviews (IPRs), Defense System Acquisition Review Council (DSARCs), and Army System and Review Council (ASARCs).

5. Monitor performance of fielded items of equipment.

SPECIAL OBJECTIVES OF TRADES

The special objective of TRADES is to provide a system that TRADOC and its materiel proponents can use to:

1. Serve as an interface system between RAM source data and RAM data users, facilitating the exchange of information between these communities.

2. Locate and identify the source of RAM data based on TRADOC user requirements.

3. Collect, analyze, and validate RAM data provided from data sources.

4. Satisfy user requirements within realistic availability of information provided by RAM data sources.

5. Retrieve, process and disseminate RAM data using units of measure compatible with TRADOC proponent requirements.

AUTOMATION FUNCTIONS

As derived from the SRD investigation, source data is located in both hard copy and automated data bases. There is a large diversity of RAM data ranging from both current and historical information found throughout the life cycle process from engineering and design documents to field experience. Automated functions for the varieties of data is as follows:

1. Operates as a system, capable of being accessed for a nominal 11 hours a day.

2. Provides RAM information at the levels in the following areas: end items, major subsystems, selected components and support and test equipment.

3. Stores and manipulates selected RAM data across the entire life cycle such as the following: reduced field experience by user mission; DT, OT and special test reports; specifications, contract and requirements documents.

4. Performs statistical and analytical manipulation of data. This permits the user to analyze data on the computer rather than off-line or manually. However, it does not preclude the performance of these tasks at separate activities by micro-processors where that capability exists.

5. Establishes a "default value" for applicable RAM data elements of Army materiel. These default values are used to respond rapidly to user requirements or when a substantiated data base is not available.

6. Provides interactive access terminal to RAM engineers for rapid accessibility of data and sources.

7. Provides quick response and source identification capability for the following essential elements of information (EEIs):

a. Mean Time Between Failures (MTBF)

b. Mean Time Between Operational Mission Failures (MTBOMF)

c. Mean Time Between Unscheduled Maintenance Actions (MTBUMA)

d. Probability of Mission Success

e. Operational Availability (A_O) (including SRO)

f. Utilization Rates

g. Mean Time to Repair (MTTR)*

h. Maintenance Ratio (MR)*

i. Administrative and Logistic Downtime (ALDT)*

In addition to these hardware measures of RAM, other available information may be stored by the proponent or user on an optional basis.

RELATIONSHIP TO PFDB

General

The objective of the PFDB System is to provide an efficient and accurate means of storing, processing and disseminating approved logistics planning factors and related data from a central source for use in joint/unilateral service planning, force development, logistics studies, and reference publications e.g., FM 101-10-1. These planning factors encompass all classes of supply, maintenance, transportation, services, and facilities.

The PFDB is a proposed system which is being developed by the Planning Factors Management Division (PFMD) of the OAD at the LOGC. The Detailed Functional System Requirements (DFSR) was completed in the fall of 1981, and PFDB is anticipated to be fully operational by January 1984. This system is described in more detail in Chapter V of the System Requirements Definition (SRD) report. The PFDB will interface with many organizations throughout the Army and with some organizations of other Services. The following organizations are

*By level of maintenance.

candidates for direct output report dissemination through telecommunications: USAREUR, FORSCOM, all Army corps, CAA, MTMC, ADMINCEN, Aviation School, Quartermaster School, and the Transportation School.

The PFDB may be characterized as a partially distributed automated processing system since it is configured with a dedicated mini-computer (estimated to be the size of a VAX 11/780) linked to a mainframe (eg. DPFO's UNIVAC 1100) both accessible by a number of interactive as well as batch terminals. Central management and control of the planning factors system will be accomplished by the PFMD through the mini-computer.

The MTD File will be integrated into the Planning Factors Data Base System in both hardware and software.

The future PFDB system software will involve four major functions feeding the Planning Factors Data Base. These are collection, analysis/development, and validation and storage. Likewise, four essential functions are involved in providing credible output from the data base to users. These are retrieval, development/aggregation, validation and dissemination. A management function is required to assure effective and efficient operation of the other functions.

The PFDB functions lie in five general areas: data maintenance, user access, management information support, data base administration, and software maintenance.

Four of the five major software processes contributing to the production use of the PFDB (data maintenance, user access, management information, and data base administration) will have a module associated with the process. Each of these modules depends on a general data base management system.

Figure 3-2 maps the operations of the TRADES Alternative Concept of Operation (ACO) on those of the PFDB System.

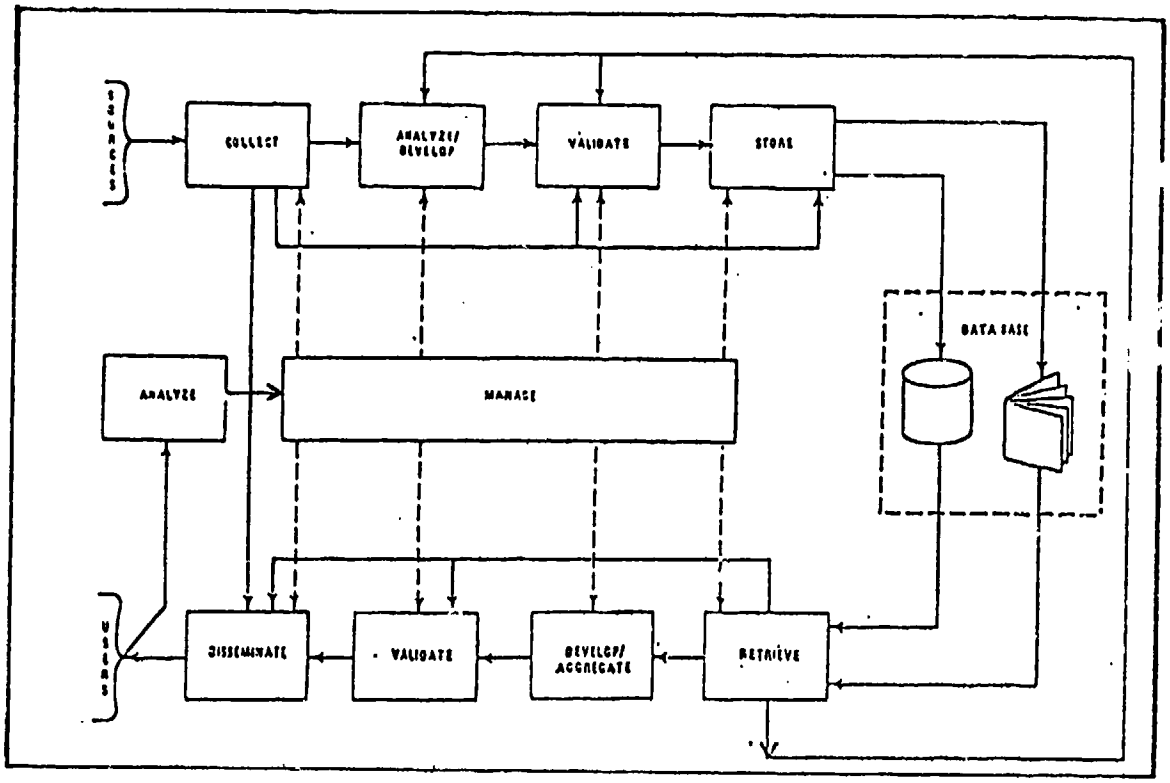


Figure 3-2. Future PFDB System Structure for Software

Organization

TRADES is supported by a centralized functional element and automated data processing element. Decentralized functional and ADP operations may also be performed at user locations.

External Organizational Interfaces

Interface between the TRADES office and the Planning Factors Management Division (PFMD) is essential for coordinated development of both the TRADES and PFDB System, i.e., software or hardware developments may be accomplished mutually, hence, more cost-effectively. Further, interface is required between the TRADES office, the LOGC Computing Center, and the TRADOC DPFO to ensure adequate customer service and computer (i.e., mini-computer, UNIVAC 1100, and telecommunications) support is maintained. This interface will also ensure that TRADES requirements in terms of job runs, interactive service, protocol, storage requirements, etc., are coordinated.

The other organizational interfaces will include the organizations (other LOGC Directorates, TRADOC Schools and Centers, TRADOC Boards, and DARCOM activities) that interact with the TRADES either as users or sources. It is important to note that some of these users and sources requiring interface with TRADES also require interface with PFDB.

The operational concept includes a feature which would provide direct access to the Defense Technical Documentation Center (DTIC) through the TRADES system. This feature is incorporated into the Source Identification process, and implemented through the Interface Module. TRADES will communicate (upon request by the user) through a communication network similar to Time Net. The user, in effect, is patched through the TRADES system, using Modem switching and automatic dialing software and hardware, and would communicate data requirements directly to the DTIC computer. The DTIC computer, a UNIVAC 1100/82, provides directory service to thousands of documents which are of potential importance to the RAM engineer; i.e., most OTEA and TECOM test reports.

TRADES OPERATING MODULES

The basic TRADES system concept includes five modules which are controlled by a master TRADES executive program. These modules (shown in Figure 3-3) include:

1. Source Identification
2. Interface
3. Quick Response
4. Statistical/Analytical
5. Management

Their description and data content are explained in succeeding paragraphs.

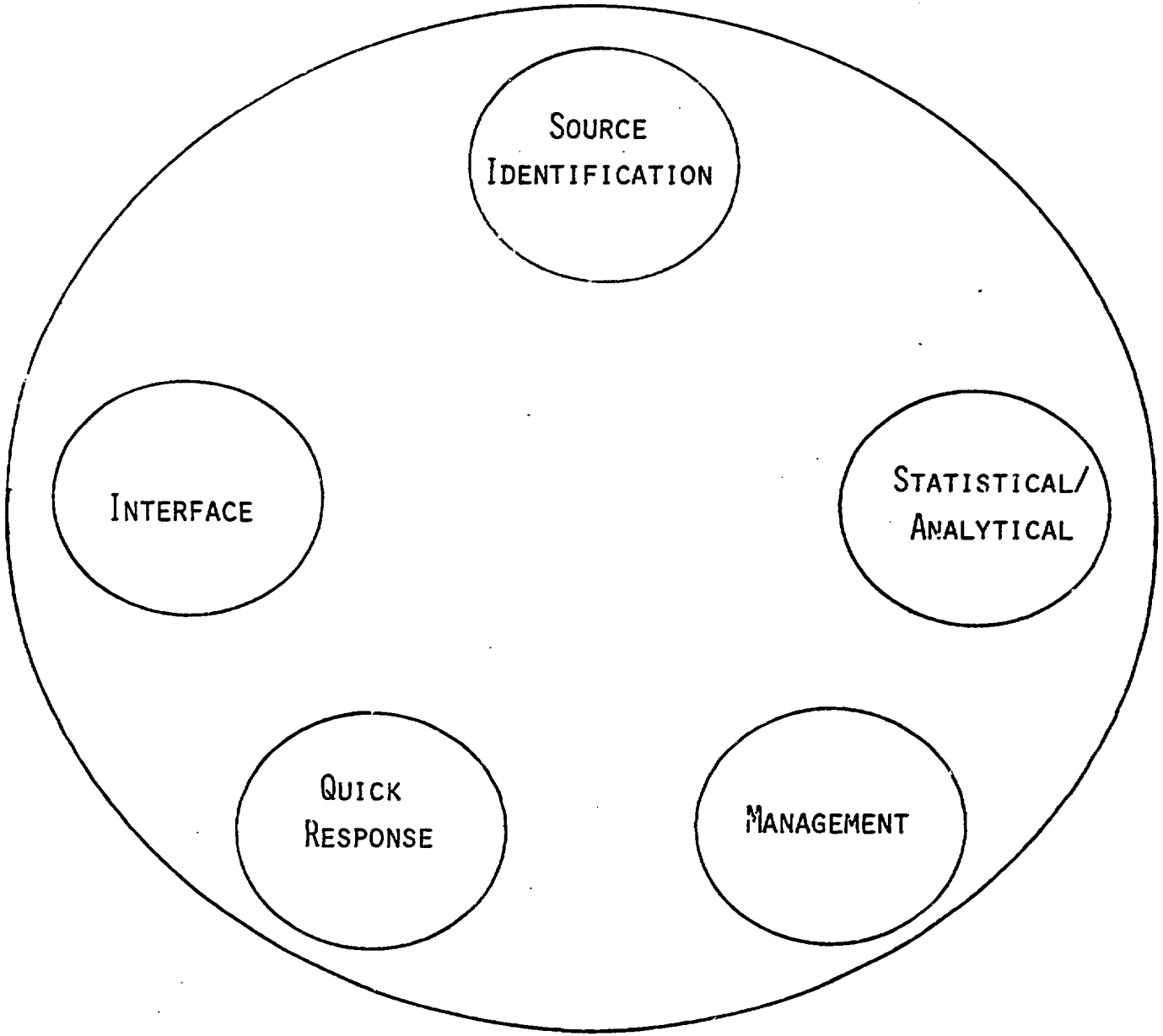


Figure 3-3. TRADES System Concept Modules

Source Identification Module

This module is the basic vehicle by which RAM data users can query a central repository for all sources of appropriate RAM data. It contains a logical organization or taxonomy of all commodities of interest to RAM data users, to the end item, major system or subsystem levels. Selected components and support and test equipment may also be entered as required. This module provides the user with:

1. Agency and/or activity with appropriate RAM data holdings

2. Form of data (hard copy, automated unclassified and/or secure data bases)

3. Extent of holdings (years of information, number of test reports, total number of records, etc.)

4. Form of data (test reports, raw field data, reduced data, analysis results, etc.)

5. Environmental conditions (e.g., peacetime versus combat, geographical area, arctic versus tropical, desert versus cultivated areas, etc.)

6. Point of contact

7. If automated data base:

    a. Accessibility through user terminal

    b. Necessary passwords, machine interface, baud rate, etc.

    c. Protocol and procedures for obtaining data.

In the event that an automated data source is identified in query, this module provides complete description of file layouts, EEIs in each field of data, together with necessary identification and definition of terminology to provide the user with information relative to user requirements which may be matched by the data base.

Interface Module

This module contains the necessary protocol to communicate with the diverse computers which may contain RAM data bases within DA (or other military services, as required). Access to the interface module is indicated from the source identification module, depending on the specific user requirements and source identification. To the extent feasible, this module also contains adequate software to provide the user with a basic vehicle for extracting, analyzing, and formatting outputs from automated data sources.

Quick Response Module

This module provides an immediately accessible value for each applicable EEI (and the conditions under which it was derived) for the system. These values represent the best technical estimate for the EEIs based on all available data for the system. The values contained in the Quick Response Module are updated by the TRADOC proponent agency upon the availability of more current/more accurate data as the system progresses through the life cycle.

Statistical/Analytical Module

The purpose of the Statistical/Analytical Module is to facilitate the preparation of RAM statistics, perform tests of hypotheses, to determine whether the effect discerned is due to chance, whether there are trends, and to assess the stability of observations.

Computations and methodology which may be a part of TRADES are the following:

1. Analysis of variance
2. Analysis of covariance
3. Data Transformations
4. Distributions and Processes
   a. Normal
   b. Binomial
   c. Gamma
   d. Chi-Square
   e. Weibull

f. Log Normal

g. Exponential

h. Poisson.

5. Utility Routines

   a. Matrix operations (e.g., inversion)

   b. Plotting

6. Time Series Analysis

7. Descriptive Statistics (Curve-fitting, Central Tendency and Moments)

8. Regression (univariate and multivariate)

9. "Interactive" Data Analysis.

10. RAM Rationale Annex Handbook Methodology

Management Module

This module provides the key tool for the TRADES users and managers to manage the TRADES system. Its primary functions are:

1. Provides a basis for updating and developing the other modules on a regular basis

2. Provides an audit trail of actual TRADES utilization, and

3. Provides the proponents with a method to record procedural notes for later access (i.e., provides an audit trail of RAM ground rules).

Estimated Volume

A total of 89 megabytes of on-line storage is estimated for the TRADES System (see Table 3-1). This is based on the following tables (3-2 to 3-5) and calculations, based on approximately 1,000 end items under development currently, and expansible to 10,000 lines of material with RAM significance. When TRADES is extended to all 10,000 possible RAM significant items, total file sizes may exceed cost-effective

on-line storage capacity of the computer system. At that time, consideration can be given to off-line storage of low priority item RAM records. Available tape drives can be used to "hang" the appropriate storage tape on-line when queries are received for the low priority records.

TABLE 3-1. TRADES MODULE FILES - SIZE FORECAST

MODULE	FORECAST SIZE (Bits)
o Source Identification Module	54.0
o Quick Response Module	30.5
o Interface Module	2.5
o Management Module	1.0
o Statistical/Analytical Module	> .5
TOTAL	88.5

TABLE 3-2. SOURCE IDENTIFICATION ENTRY

ELEMENT	AVERAGE CHARACTERS/RECORD
Agency/Activity	240
Automated or Hard Copy Classification	10
Extent of Holdings - Years, Reports, Records	50
Form of Data	50
Environmental Conditions	50
Key Words and EEIs Applicable	500
Abstract	600
Accessibility for Automated Data Base	500
TOTAL	2,000

TABLE 3-3. SOURCE IDENTIFICATION MODULE FILE SIZING

MAIN DATA AREA	# OF ITEMS	AVERAGE # OF REPORTS	TOTAL REPORTS	# OF CHARACTERS	MEGA-BYTES
End Items	1,000	4	4,000	2,000	8
Subsystems	3,000	4	12,000	1,000	12
Components	15,000	2	30,000	1,000	30
Test & Spt.	1,000	2	2,000	2,000	4
TOTAL	20,000				54

NOTE: For all references to sizing, one character is equal to one byte.

TABLE 3-4. QUICK RESPONSE ENTRY

ELEMENT	AVERAGE SIZE (Characters)
OMS/MP	200-2000
FD/SC	800-8000
Life Cycle Stage	5
Distribution	20
Total Incidents Experienced (5 per EEI)	40
Sample Size (6 per EEI)	48
Environment	50
Time Breakdown	48
TOTAL	1,200 - 10,211

TABLE 3-5. QUICK RESPONCE MODULE FILE SIZING

MAIN DATA AREA	ESTIMATED QUANTITIES	CHARACTERS	MEGABYTES
End Items	1,000	10,000	10.0
Subsystems	3,000	1,000	3.0
Components	15,000	1,000	15.0
Test & Support	1,000	2,500	2.5
TOTAL	20,000		30.5

AUTOMATED RAM DATA REFERENCES

At present, a certain amount of RAM data is being stored in automated data systems. However, with the near implementation of CTDCS and the future consideration of SAMS, increasingly larger portions of RAM data will become available from these automated data systems. Accordingly, TRADES recognizes two potential conditions relative to automated source data bases:

1. RAM data resident on a large-scale computer system with interactive software capability, where a user can select certain data and be provided an analyzed output format.

2. An automated data base which is principally a repository of RAM information with little or no interactive software capability.

If condition 1. prevails, the TRADES interface module will structure specific requirements which can then be processed on a resident computer. The product would be an output report, either hard copy mailed or on-line printed through a high-speed printer, of a product directly usable by RAM engineers.

In condition 2. above, the overall TRADES computer system must have provision for data extraction programs and all of the associated software to process the information into usable form by application of the statistical/analytical module in the TRADES computer. In parallel with this is the requirement for the TRADES computer to extract the necessary elements of data from the resident data bank and store the information temporarily during the processing. The output would be a direct product of the user via the TRADES terminal, and peripheral high-speed printers.

A third alternative may be used when the user has a relatively large capacity computer available. Here, TRADES could make provision to extract relevant data fields from the resident RAM data base, and provide the data elements to the user's computer facility. Likewise, temporary storage of pertinent information for future use is possible. In such event, the end results must be entered into the historical module, if the system is not to "hemorrhage."

CATEGORIZATION OF DATA FILES

Storage Location

The data files will generally be in three locations:

The principal location of mass storage (shown in Figure 3-4) will be on the PFDB/TRADES mini-computer located in the LOGC Computing Center at Fort Lee, Virginia. Both on-line and off-line storage capabilities are recommended for prompt user response and archival storage respectively. Disk, tape, or card storage are adequate for TRADES based on the response time requirements established previously. However, interactive requirements will require disk operations and requisite CPU memory capacity. (The TRADES mini-computer should be capable of accommodating an optical disk for archival storage as it becomes available in the near future.) Storage will be sufficient for interactive use of up to 40 users and Data Base Management System (DBMS) operations.

The second area for both on-line and off-line storage is at the TRADOC DPFO. The UNIVAC 1100 should have sufficient storage for the TRADES systems for both interactive and batch operations for up to 40 users (providing back-up and safety).

The third location for storage will be at the user terminal. It is anticipated that many users will have local storage capability. (Currently available micro-computers and terminals have reasonably low cost storage capability in the form of floppy disks or magnetic tape cartridges.) User unique programs, results, and local working RAM information is anticipated to be stored at this location.

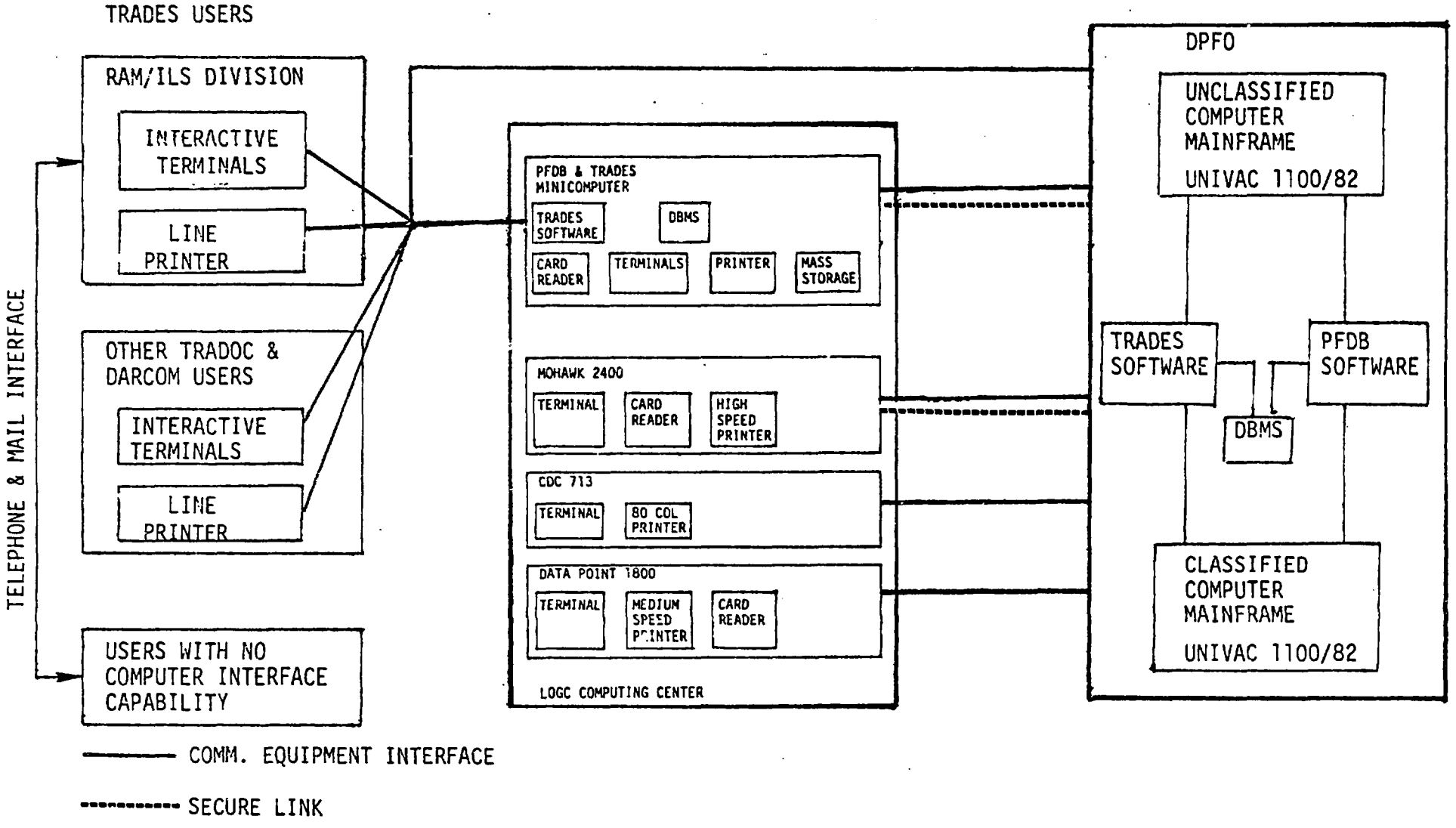


Figure 3-4. TRADES Alternative Concept of Operation (ACO) Using PFDB System

Source

The contents of the data base will come from a wide variety of sources. Information for the Quick Response Module will be entered by the proponent activity, from engineering, test and field data. This data may be either entered directly utilizing routine management update procedures, or captured upon completion of a statistical manipulation of raw data provided by external data sources.

A detailed listing of data sources is provided in Chapter IV of the SRD. The data sources are in a wide diversity of substance and format, and with the exception of the high use common systems, are frequently filed in locations off-line. The Source Identification Module catalogs these data sources, along with known information (both automated and hard-copy), and makes their availability known to users as required. The information for these purposes will be provided by data sources on a regular basis, upon a periodic review and request for information by the TRADES management office. Additionally, DTIC information will be available on-line using through-put procedures through TRADES.

Mode of Access

The mode of access to the TRADES system will be manual and through interactive terminals and batch processing.

Manual Mode

For those users who do not have terminals (estimated to be about 50% in SRD), solicitation for RAM data and analysis products will be made by mail or telephone calls to the TRADES office until all users have access to (or are provided with) a terminal. The additional staff recommended previously will be sufficient to handle the initial load (growth in number of users in the future may necessitate additional personnel).

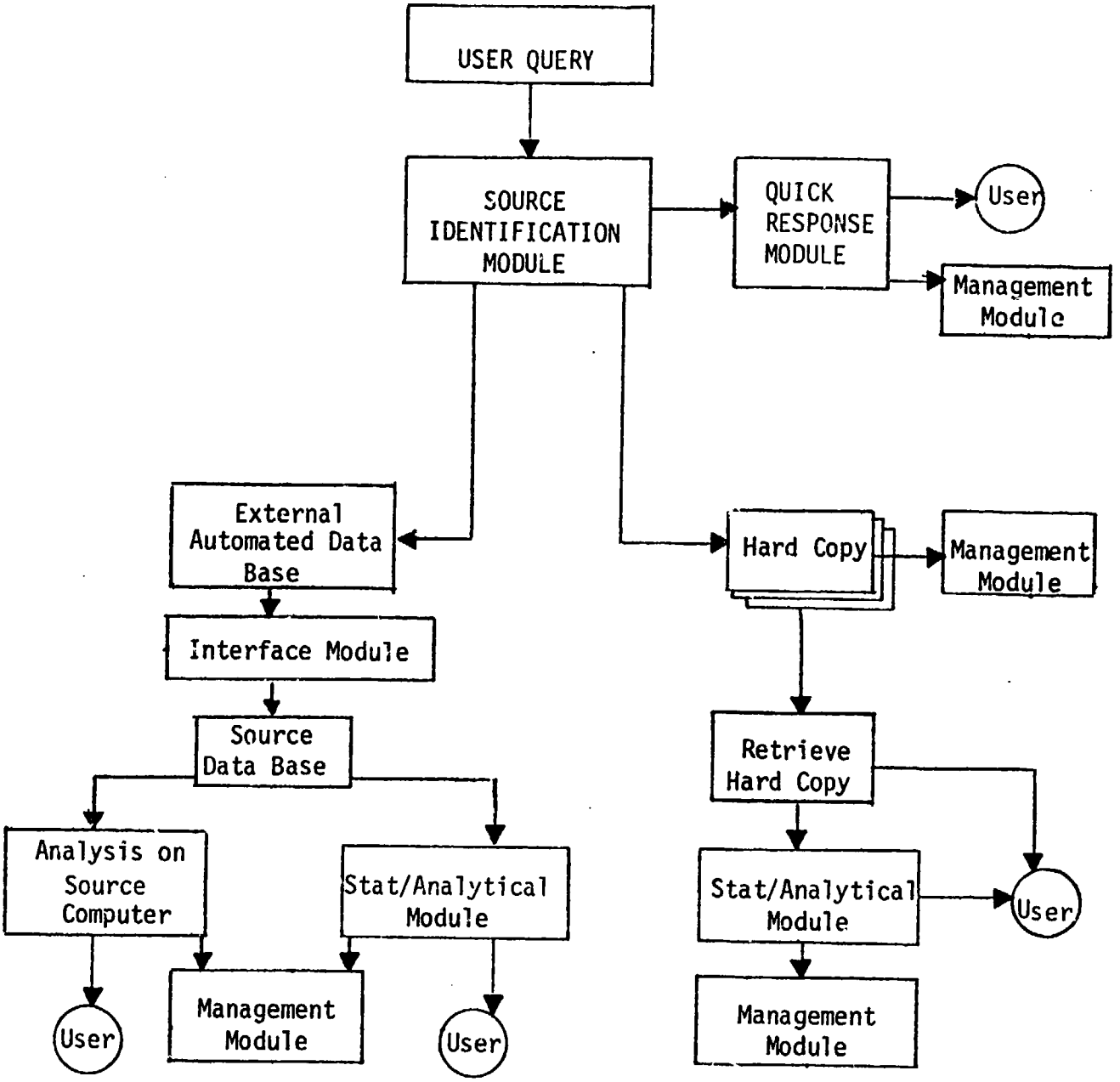


Figure 3-5. TRADES Request Flow

Interactive Terminal Operations Mode

Those users with computer terminal equipment can access TRADES directly on the PFDB-TRADES mini-computer located in the LOGC Computing Center or UNIVAC 1100/82 time sharing mainframe at DPFO, Fort Leavenworth via normal telephone lines (phone numbers will be assigned by DPFO and the LOGC Computing Center to appropriate computer access ports).

Normal "log in" procedures to access the mini-computer or the mainframe will be used to interact with TRADES.

For users who have computer terminals and secure link capability, access is gained with procedures similar to those described above for unclassified users.

Batch Operations Mode

Batch runs will be made principally through the TRADES office. However, it is anticipated that both the Planning Factors Management Division and LOGC Computing Center at Fort Lee will be able to accommodate "batch" requests from users for TRADES inputs or outputs. Users with or without terminals may use this capability.

End Products Description

Format:

Two types of end products will be available through TRADES. The first will be formatted in a form suitable for interactive queries. For example, where an interactive query is "M60A1 Tank reports in OT I?" the output may be:

"M60A1 Tank Reports = OTEA REPORT OT I"

The other type of end product will be the fixed report. In special cases where information is required by users on a routine basis, it is more practical to produce a formatted report or table of values rather than a few data points per query.

For example, for a query, "Print OTEA Test Report on M60A1 OT I," the predetermined and formatted output would be in report or tabular form with a number of essential data being displayed.

Interface between Users/Data Sources/Automated Systems

The principal interface between users and data sources or other automated systems containing RAM information is through the TRADES "Interface" Module.

TRADES will become the primary interface mode between the users of TRADES, primarily TRADOC, and the sources of RAM information, primarily DARCOM. The TRADES system will create a free exchange of information and facilitate the ability of the user to rapidly locate and acquire RAM data.

This effort will be done primarily in the following manner. Known data sources will be categorized and placed in a logical order for use in the Source Identification Module. This logical order or taxonomy, should be based on the TM 38-750 breakout of equipment. Wherever possible, subsystems and components will be identified and ordered in such a manner to provide for cross-referencing similar components or subsystems between end items. This taxonomy will be provided to all users for access during inquiry procedures.

Information catalogued by DTIC will be available on-line through TRADES.

TRADES will provide the user query with information on the location of source data (See Figure 3-5). The user then proceeds with obtaining the data, either interactively if from another automated source, by off-line follow-up for hard copy requirements, and/or by information stored in the Quick Response Module.

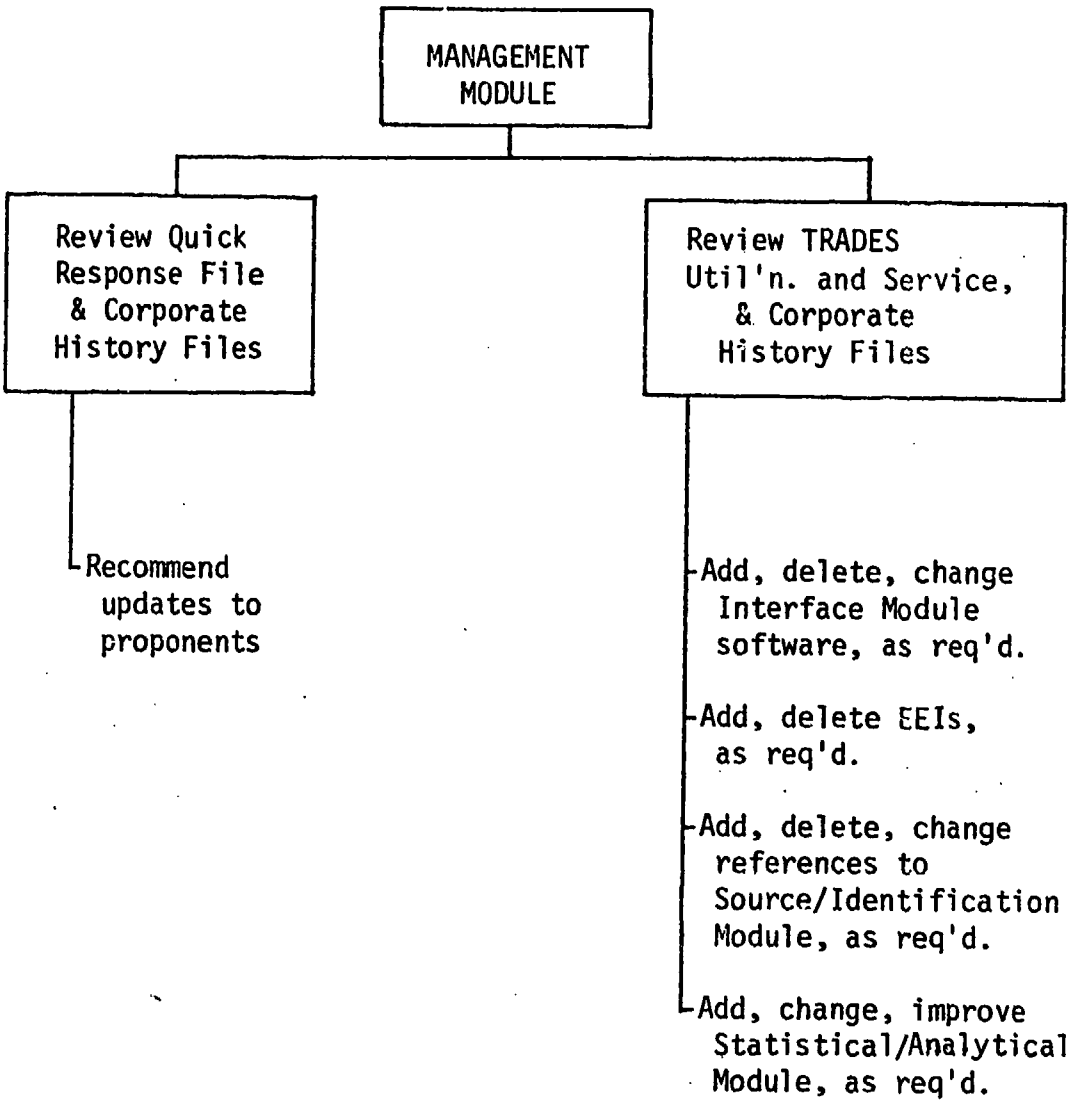


Figure 3-6. TRADES Management Functions

Upon obtaining data required and performing desired statistical manipulations, the user may then temporarily store selected information in TRADES using shorthand notes or off-line storage. If the user is the proponent for a given report, that information may be stored in the Quick Response file for access by other users. (See Figure 3-6).

The TRADES office will conduct periodic updates and surveys of data sources to ensure that all relevant data sources are identified and acknowledged for entry into the Quick Response file.

Table 3-6 addresses the most frequent automated sources of RAM data expected to be used and made available.

Of particular significance to a thorough understanding of system operations are Chapters IV, V, and VII, which detail the internal operating characteristics, the external operating characteristics, and the TRADES software requirements.

TABLE 3-6. KEY DATA SOURCES*

Y-WIDE RAM SOURCES	COMMODITY ORIENTED SOURCES
LSAR	RAM/LOG
TECOM	TAIDB
CTDCS	VETMIS
DRS	SATCOM
TELIS	NUCWEP
COMA	
TAERS/TAMMS	
SDC	
SAMS	
MTD	

*Reference APJ Report 892-2, "TRADOC RAM Data Evaluation System (TRADES) (ACN 51235) - System Requirements Description" for descriptions and definitions

CHAPTER IV

INTERNAL OPERATING CHARACTERISTICS

GENERAL

The purpose of this chapter is to provide a clear, detailed description of the internal operations of the proposed system. The chapter will describe techniques for data retrieval, data processing, and data dissemination. This chapter also contains flowcharts which form a basis for functional understanding of the system, but are not detailed enough to permit software programming. This chapter also describes procedures for acquiring, verifying and storing data. (Definition, design, and programming activities for TRADES will occur in the later life cycle stages of TRADES). In addition to this chapter, a thorough review of Chapter VII, Software Requirements, is highly recommended for a complete understanding of the internal operations of TRADES.

TRADES DATA ACQUISITION VERIFICATION AND STORAGE

TRADES acquires, verifies and stores information for five principal reasons:

1. To identify sources of RAM data (Source Identification Module).

2. To identify RAM values for end items, subsystems, components and test and support equipment (Quick Response Module).

3. To access information stored in other data banks (Interface Module).

4. To facilitate data manipulation and computation by the RAM Engineer (Analytical/Statistical Module).

5. To provide management information for the storage and utilization for TRADES management as well as the individual RAM engineer computations for historical purposes (Management Module).

Each of these TRADES acquisition processes (modules) are described in turn:

Source Identification Module

Information for source identification is acquired primarily by off-line processes, and then entered into the TRADES system by the TRADES Management Branch on an interactive or batch input process. This update of information can occur either on an "as available" basis or during periodic management update routines. Data sources should be fully identified in accordance with the file content specified in Chapter 3 of the STP. The data system will permit change at any time. However, the record of this change, addition or deletion to the Source Identification Module will likewise be recorded in the History Section of the Management Module, and permanently filed using off-line storage when retired and archivized (See Figure 4-1).

Verification procedures are dependent upon the TRADES Management Branch to review sources and reduce appropriate references to the Source Identification Module format. Proponents would have a significant responsibility in the review of sources identified for their area of interest, and recommendations to add or delete references accordingly.

Internal verification procedures are limited to entry formatting and standard techniques for edit routines based on expected alpha or numeric entries.

Storage of sources identified for potential use will be in the active TRADES system, probably on-line disc storage, with changes to the file placed in the on-line Management Module, and eventually retrieved after periodic update routines have been completed.

Quick Response Module

The rapid identification of RAM values for all levels of RAM data is updated in several ways. The proponent, upon performing a calculation or obtaining results from a test, will enter this information into the system on the same basis as described above, (either "as required and developed" or during periodic management update routines). This may be done interactively by the proponent user, or by providing the information by card, tape or manual means to the TRADES Management

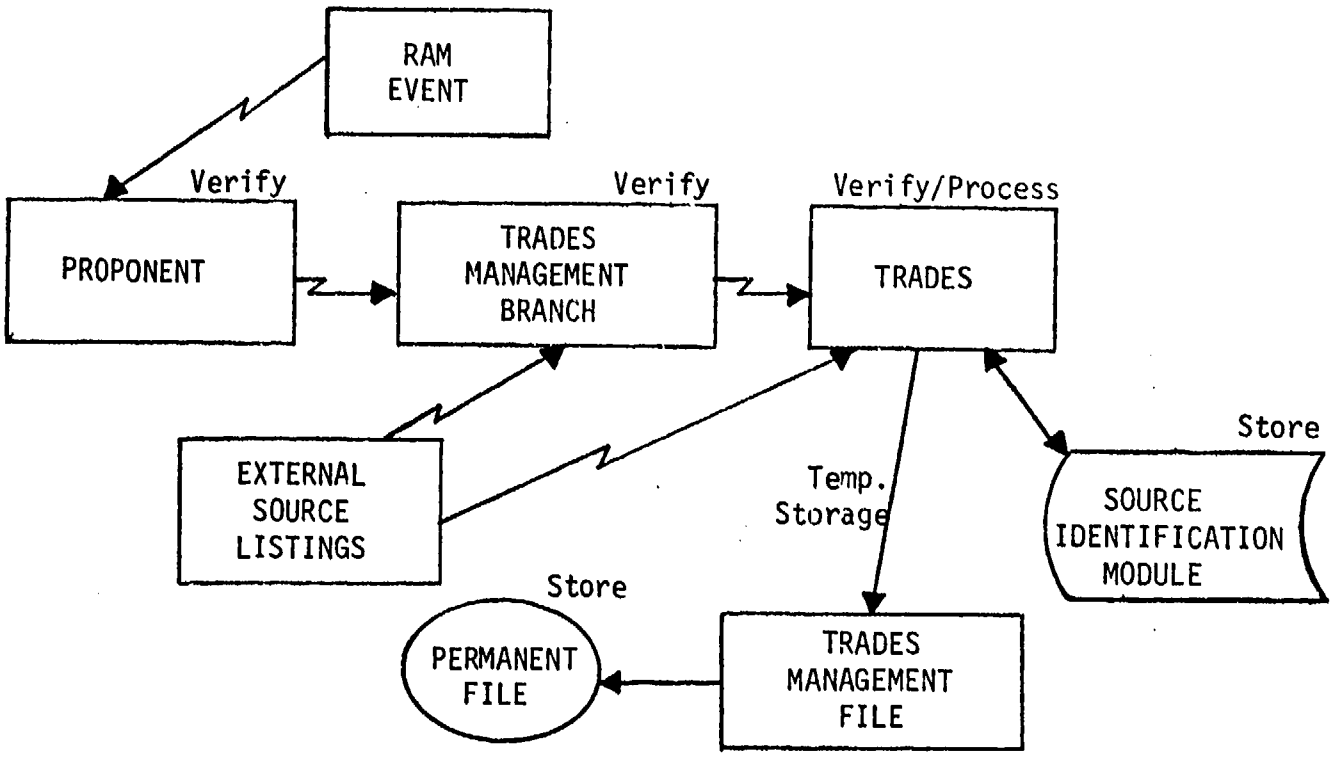


Figure 4-1. Internal Operating Concept, Acquisition, Verification and Storage - Source Identification Module

Branch, for input by the TRADES data processing center (See Figure 4-2).

Selected values which have not been provided by the proponent will be calculated based on standard factors using available RAM data from similar systems. These values, identified as "baseline" values, would be replaced as life cycle information becomes available for specific systems.

Verification of data for the Quick Response Module will be a function of both accuracy of analytical techniques and analysis of the raw data itself. For data already processed and provided in a final value (e.g., from a test report), verification would be based on the skill of the RAM engineer, if parametric checks appear to indicate questionable values. For raw data, a variety of statistical processes are available to validate data, and appropriately identify outliers, or out-of-sequence entries to determine appropriateness to the calculations.

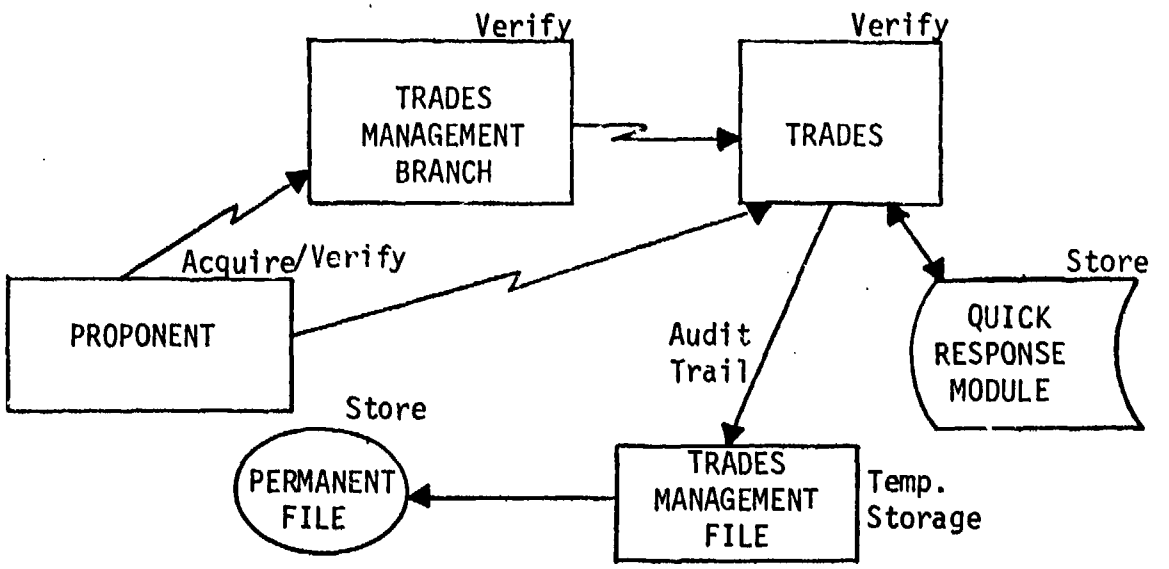


Figure 4-2. Internal Operating Concept, Acquisition, Verification and Storage - Quick Response Module

Storage of these values are in the Quick Response Module, which is in on-line disk storage. The record of change would, however, be filed in the historical section of the Management Module and subsequently retired on off-line tape storage.

Interface Module

Data information for accessing automated information systems on an interactive basis will be stored on the Interface Module of the TRADES system. Initial coordination with the common sources of RAM data will be necessary to program the Interface Module for automated interface with data sources. It will be necessary for the TRADES Management Branch to remain cognizant of all access procedures changes provided by the host data source. This will be done on an automatic basis by being on the customer list for the host automated system, or other method of monitoring updating procedures specified by that host system.

A common method of updating will be to respond whenever the standard interface module fails to achieve interactivity. In this event, the TRADES Senior Programmer in PFMD must coordinate

directly with the source data system, and make necessary programming changes or adjustments to insure that system transfer of information is achieved. (See Figure 4-3.)

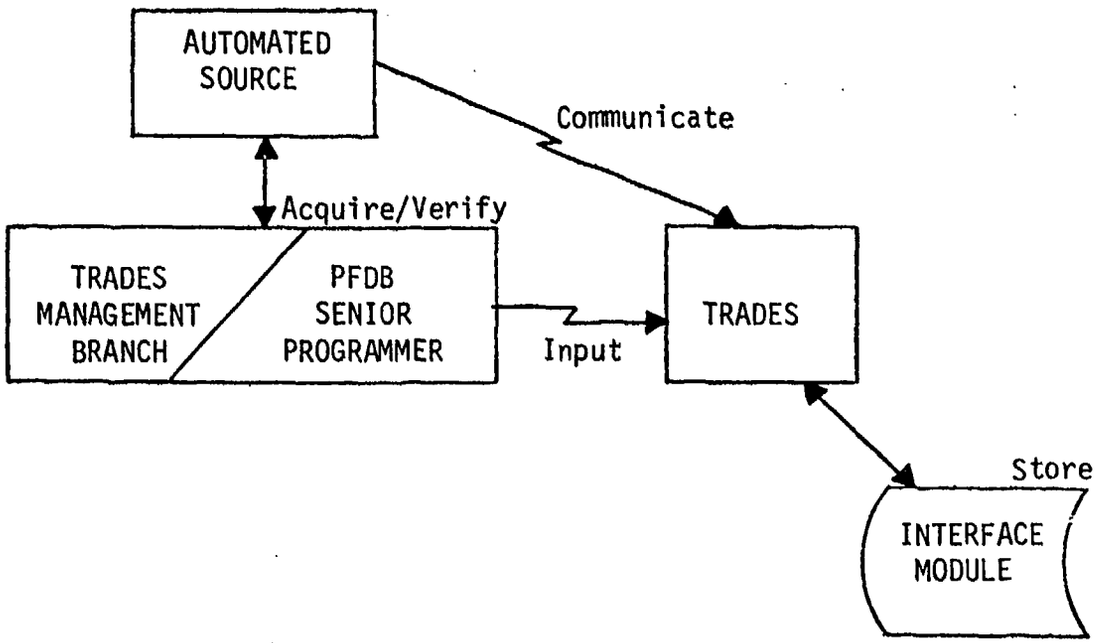


Figure 4-3. Internal Operating Concept, Acquisition, Verification and Storage - Interface Module

Standard verification procedures such as checks and length of fields will provide the TRADES programmer with information relative to the validity of the information transfer, and thus the validity of the interface program itself.

The interface procedures will be stored on-line as the Interface Module and will be changed in response to the Senior Programmer. Historical files are not required for storing these changes permanently.

Statistical/Analytical Module

The method of acquiring information from other data banks for use in TRADES is variable, and depends on the relative capabilities of TRADES and the host system. The typical method will first require off-line coordination between the proponent and the TRADES Management Branch. After coordination of data requirements with the data sources, appropriate entry into the source data system will be made by the TRADES system through communication devices. Where this is done on a routine and recurring basis, a series of interfacing software programs will already be available and will provide for rapid entry on an interactive basis as indicated above. However, data may also be provided by a source using tape or cards as available.

Information acquired from these data sources and through the Interface Module will be placed into Central Processing Unit (CPU) memory for necessary manipulation or storage actions as required. (See Figure 4-4). Verification of data received from these sources is subject to the same procedures as described previously. Additionally, "credibility checks" for gross outliers may, of course, be automated.

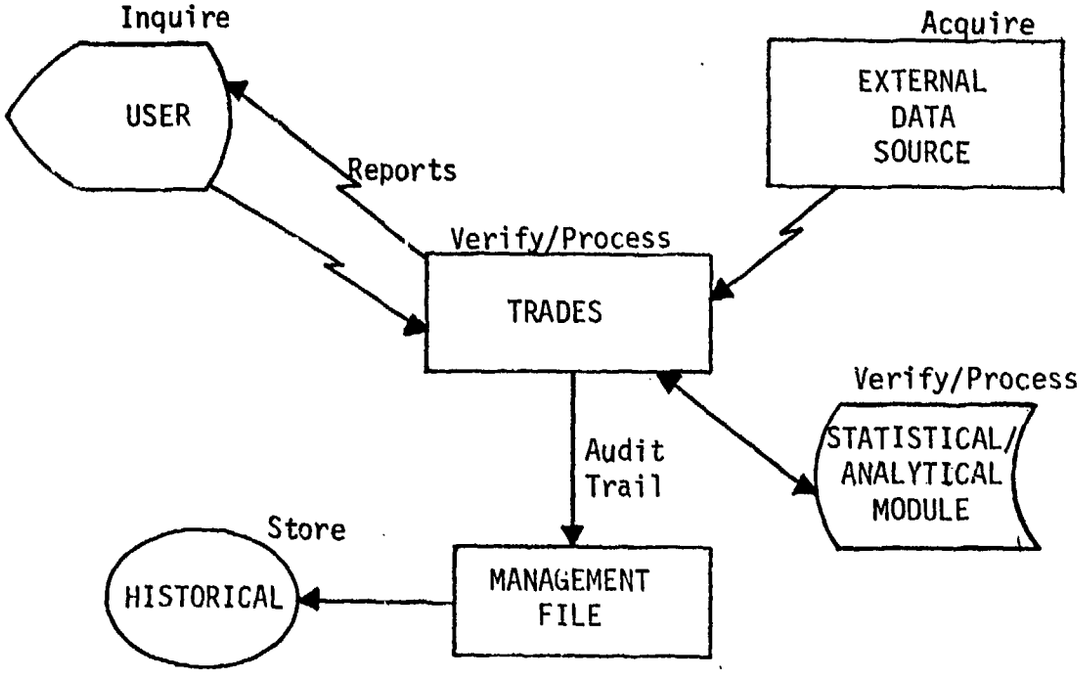


Figure 4-4. Internal Operating Concept, Acquisition, Verification and Storage - Statistical/Analytical Module

The various routines in this module are applied to information in the CPU as necessary. The functions of analysis remain on-line in disk storage as the Statistical/Analytical Module. Additional analytical procedures may be added as required to this module through the TRADES Management Branch.

Computations made by RAM engineers will be stored in total, or summarized as shorthand notes for retrieval as necessary in the management module.

Management Module

Management information and data are acquired through the automatic monitoring and recording of computer activity that occurs within the TRADES system. The normal process is done on a routine basis, which includes identifying and recording the user, module used, and total CPU time. Other data included at the proponent's option will be entered upon command using interactive entry or batch process by the proponent (or TRADES Management Branch) on an "as determined" or periodic management update process. Storage of data is a distinct function of the Management Module, and has been illustrated in Figures 4-1 through 4-4. Essential information acquired is thus a highly significant tool for management of the TRADES system by the TRADES Management Branch.

DATA RETRIEVAL, PROCESSING AND DISSEMINATION

Data Retrieval

A vital function of TRADES is to rapidly retrieve data from within the TRADES system, or from other systems on an automated basis. The discussion above dealt with data retrieved from other data banks. This discussion is limited to retrieval methods for data already available within TRADES.

TRADES is accessible to the user either through the PFMD mini-computers or direct to the computer at DPFO. The procedure for this would direct the user to use primarily the mini-computer at the LOGC in the first instance. In the event that processing is not possible due to saturation of the computers at the LOGC, the user will be directed to access DPFO.

Updating of files between the PFMD and DPFO computers will be performed automatically on a daily basis or whenever the computer is reinitialized after a period of downtime (See Figure 4-5.)

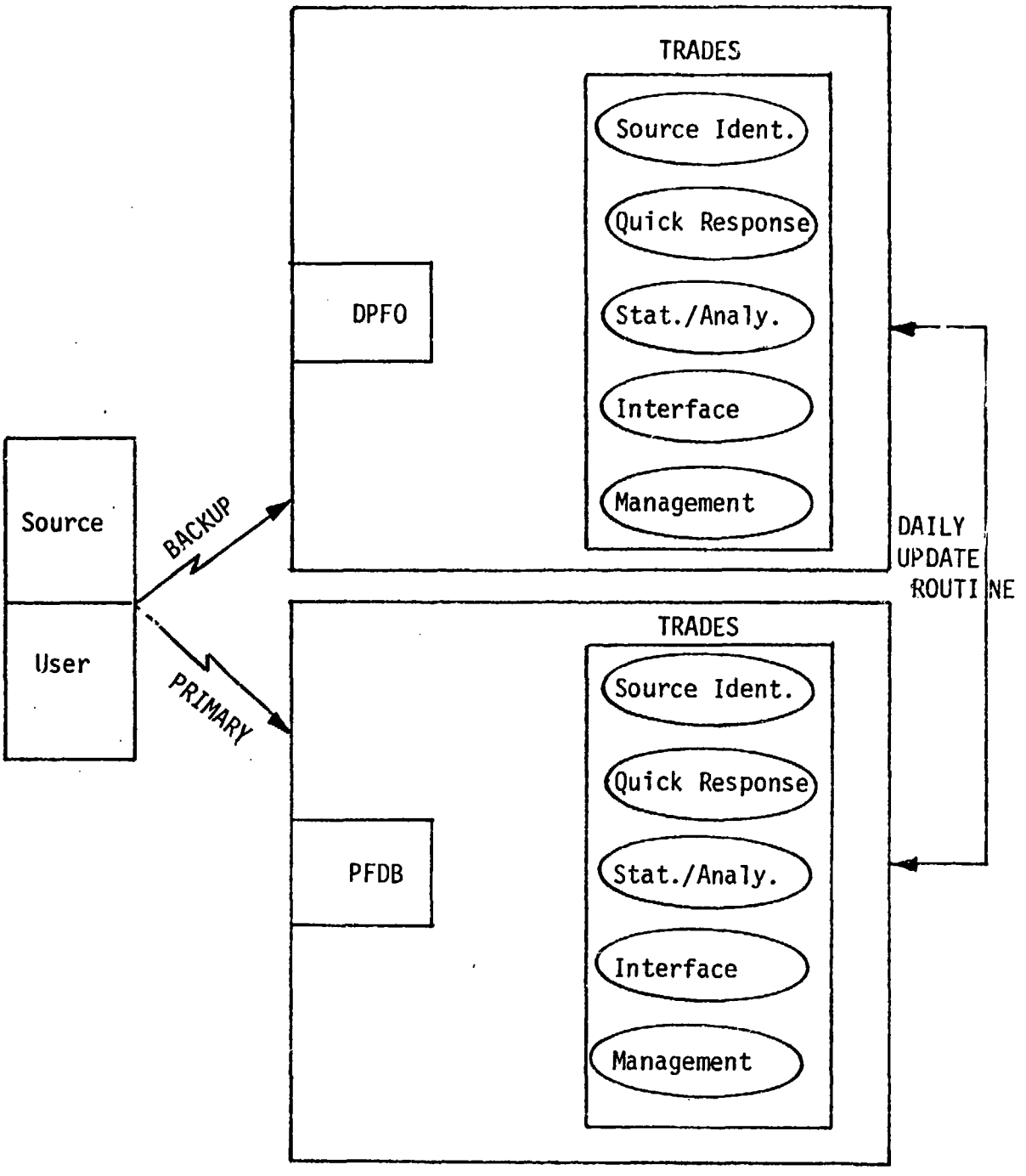


Figure 4-5. Procedure for Backup of TRADES System by DPFO

Processing

Processing data performance is identical at both PFMD and DPFO. The software will be written to ensure that TRADES is usable on both (or any large capacity computer), to ensure the portability of the system and provide necessary safety and back-up.

Dissemination Techniques

Reports and information are provided in a number of different ways. Specific data element responses are provided interactively at the CRT and the side-by-side line printer if d sired, or by magnetic tape or card output. More voluminous responses would be provided through high speed line printers available at all TRADOC installations.

Reports may also be mailed to users who do not have computing capability. The TRADES Management Branch will serve as the initial point of contact for this service and any other customer requirements relating to the dissemination of information.

SUMMARY

This chapter, in conjunction with Chapter VII, Software Requirements, provides the essential internal operating characteristics of TRADES.

CHAPTER V

EXTERNAL OPERATING CHARACTERISTICS

ELEMENTS

The primary external activities of the TRADES system may be categorized into four categories, each with a portion of the responsibility for the operation of the TRADES system. These elements are all contributors to the TRADES system when viewed in its larger sense and are categorized as: Users, TRADES functional element, TRADES data processing element, and data sources, as shown in Figure 5-1.

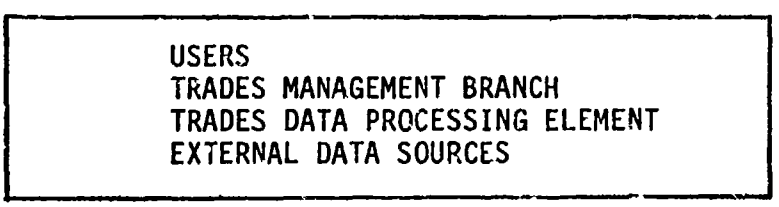


Figure 5-1. TRADES System Participants

PARTICIPANT DEFINITIONS

User

A user is an activity, normally located in TRADOC, whose responsibilities include the determination of RAM characteristics for the combat development process, as specified in AR 702-3 (with TRADOC supplement) and other related combat development materiel responsibilities. Anticipated users are listed in Appendix D to the SRD.

TRADES Management Branch

This activity provides TRADES system management, methodological and analysis support, and source and user functional area customer assistance.

TRADES Data Processing Element

This function incorporates the responsibility for programming changes, special ADP manipulation, as required by TRADES users and the TRADES functional elements to include management and use of the interface module for extraction of unique data requirements from data sources.

External Data Sources

Activities such as the Material Readiness Support Activity (MRSA), or the Operational Test & Evaluation Agency (OTEA), among many others, provide RAM related information to TRADES. Examples of information systems which provide this data for fielded, design and test environments are SAMS, LSAR, and COMRAM. Sources of data and their activities are listed in Table 3-3 of the SRD and portray the common relationships between users and sources. Data sources are described in detail in Chapter IV of the SRD.

FUNCTIONAL USERS RESPONSIBILITIES

It is envisioned that TRADES users in TRADOC will have both a "use" function and a "control" function. User activities are staffed with RAM functional personnel and are located in TRADOC integrating centers, schools, test boards, and in the RAM/ILS Division of the Materiel Systems Directorate, U.S. Army Logistics Center. Personnel in the RAM offices of the TRADOC schools, centers, boards, and TSMs support TRADES in areas for which they are the proponents. These responsibilities are:

1. Update of the Quick Response Module files for values for which they are the proponent.

2. Customer Service and Assistance, for support primarily to activities within these locations or span of responsibilities.

3. RAM Analysis, for requirements documents and fielded developmental items within the RAM engineer's mission.

Additional personnel must be authorized in some cases for this system and are described in Chapter VI of the STP. In all cases, it is imperative that user personnel be trained and familiar with the capabilities of the TRADES system. The system is designed to be "user friendly", but does presuppose some familiarity with RAM terms and procedures.

User Procedures

When a requirement for RAM data is identified, the user queries the Source Identification Module in terms of a specific EEI for an end item, subsystem, component, or support and test equipment. This can be further delineated by geographical conditions, local environments, and type of data, e.g., DT, OT, or field.

This inquiry may be performed by direct interactive terminal capability to the TRADES system. Secondary methods of telephone inquiry or mail are also authorized (See Figure 5-2).

The information inquiry is received by the TRADES system, and a response prepared by the computer in accordance with the requested information. If the response is handled on an interactive basis, which assumes the user has an inquiry device such as a terminal, there will be an immediate response, depending upon queueing at the TRADES computer. A series of interactive queries with the computer will narrow down the sources for appropriate RAM information. Further, the user may be "patched through" the TRADES system and placed on line with the Defense Technical Documentation Center (DTIC) computer. Queries and responses, using the DTIC key words will then be begun and choices narrowed down accordingly.

Based on the responses received and the selection process of the RAM Engineer, requests for hard copy information may be performed off-line, RAM information requested and received from the TRADES Quick Response Module, or a request made for information from an automated data source. These steps are graphically shown in Figure 5-3. If no data sources are identified, the user may proceed off-line with a request for assistance by the TRADES Management Branch.

If information is available for hard copy sources, the types of information provided by TRADES will be:

1. Title, Date, Issuing Activity

2. Location

3. Abstract

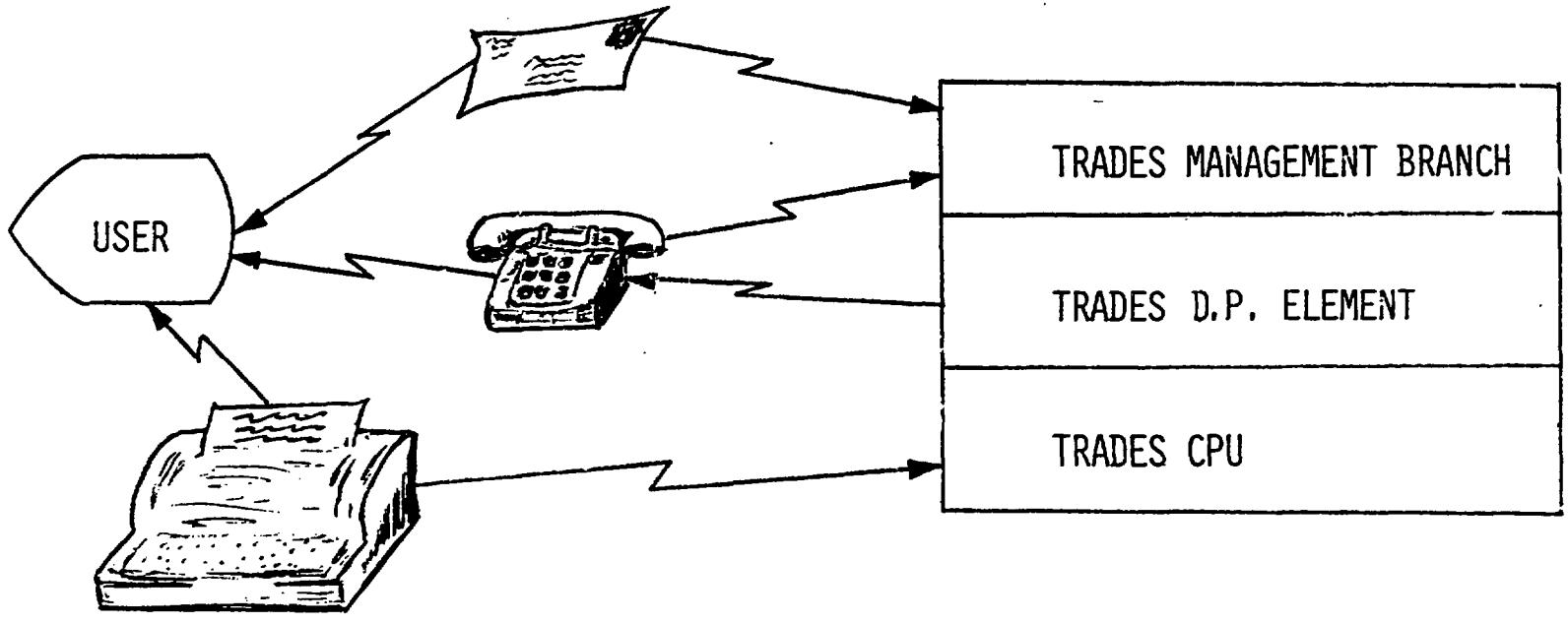


Figure 5-2. Secondary Methods of TRADES Inquiry

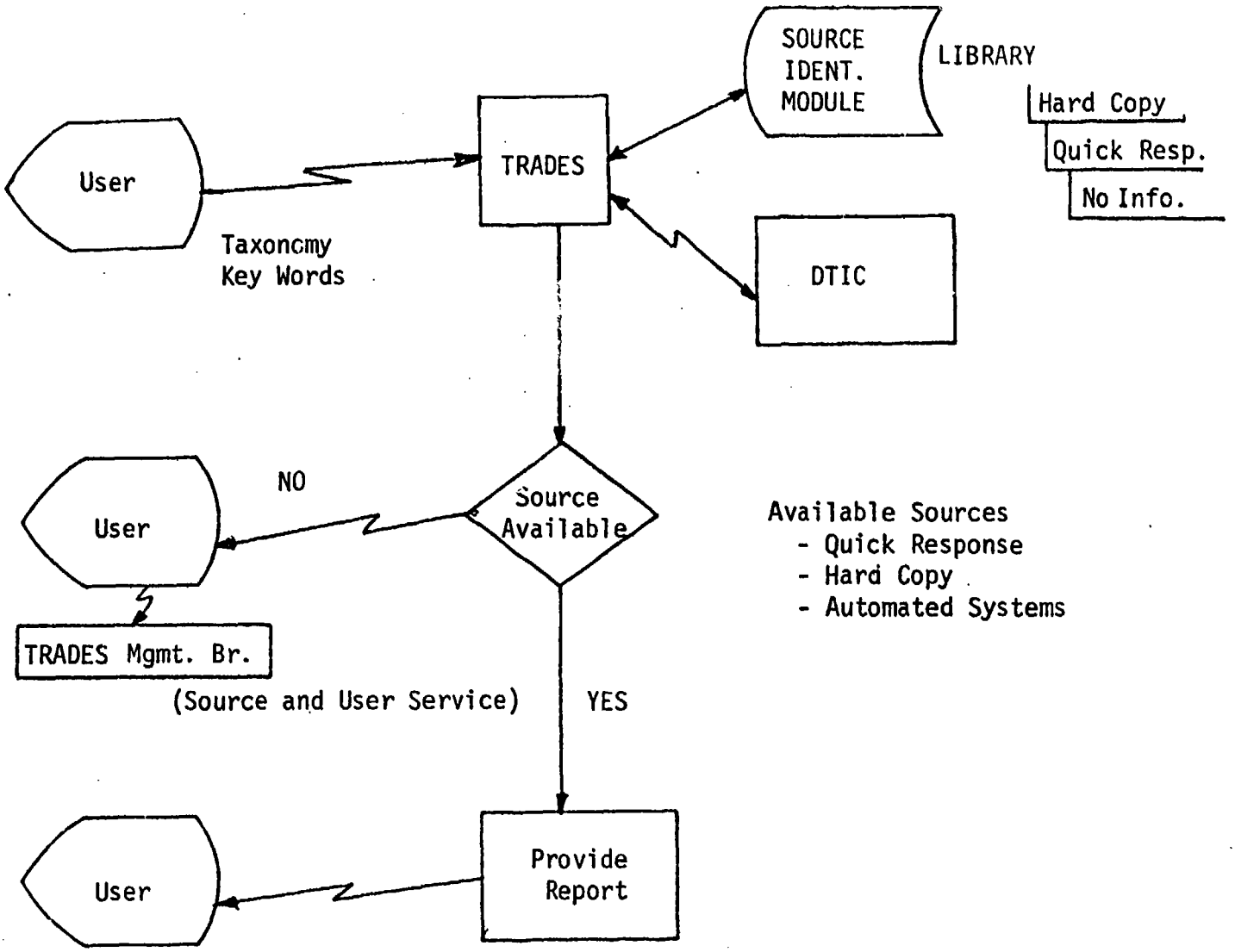


Figure 5-3. Inquiry for RAM Data Sources

4. POC/Name/Telephone No.

5. Address

6. Instructions to obtain document.

The user will proceed with ordering the document through TRADES when a DTIC source is indicated, or offline when another source is indicated. When the hard copy document is obtained, the user will review the document and extract relevant RAM data. If deemed appropriate, the user (designated proponent only) may also enter selected document data into the Quick Response module which would then make this information available on a recurring basis to other TRADES system users.

The Source Identification Module may also yield intelligence that data is available in the Quick Response module as well as external automated systems, such as COMRAM. When information is available in the Quick Response Module, this may be provided either interactively on the terminal or off-line printer, or may be requested and mailed to the user if terminal capabilities do not exist. Figure 5-4 indicates the flow of information from a quick response inquiry.

Data from external automated sources may be received either in raw or reduced fashion. Depending on the desires of the RAM engineer, this data may be further manipulated through "what if" exercises on the TRADES computer, and data further interpreted by the Statistical/Analytical Module. This procedure is illustrated in Figures 5-5 and 5-6.

User Update Responsibilities

Values derived through manipulation of data, or received from sources such as tests, may be stored in the Quick Response Module by the proponent. This data, with identifying/modifying characteristics, will then be available for comparative information to other users of TRADES. These files will be updated on a regular as well as "as required" basis.

Regular update routines will be initiated by the TRADES Management Branch based on the management function inherent with that responsibility.

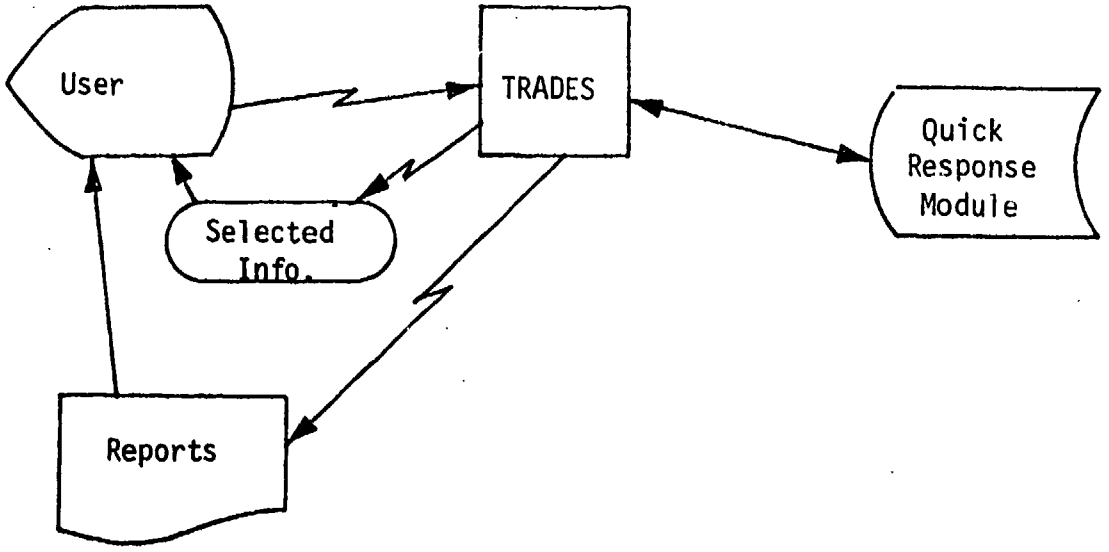


Figure 5-4. Quick Response Inquiry

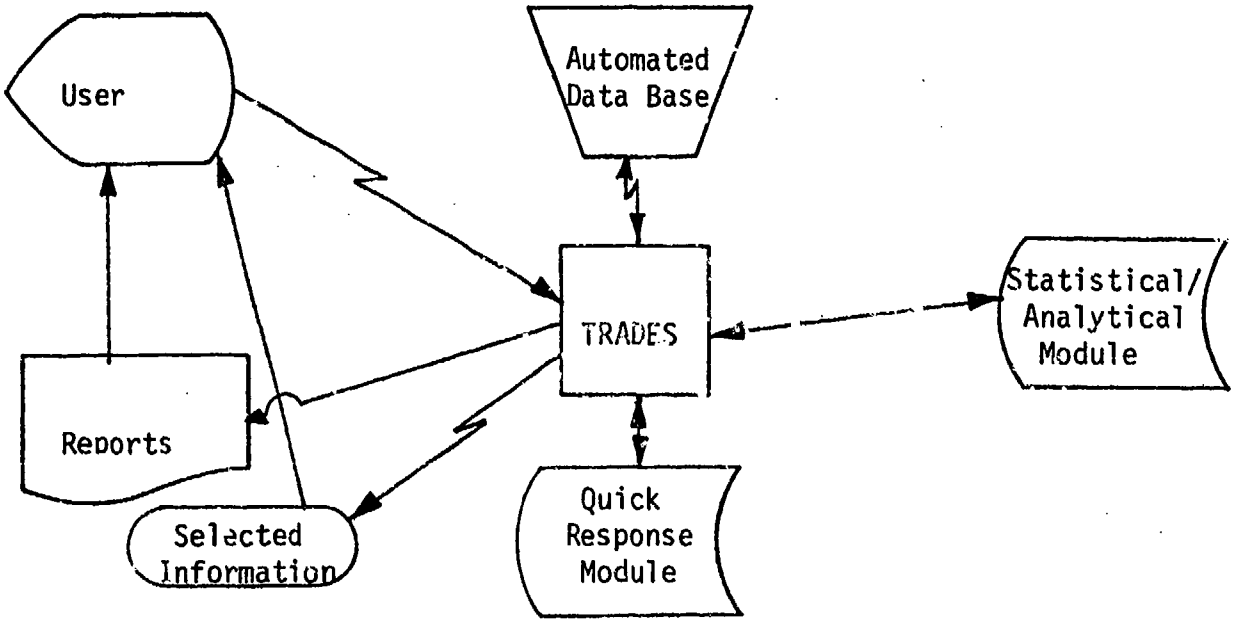


Figure 5-5. Statistical/Analytical Module

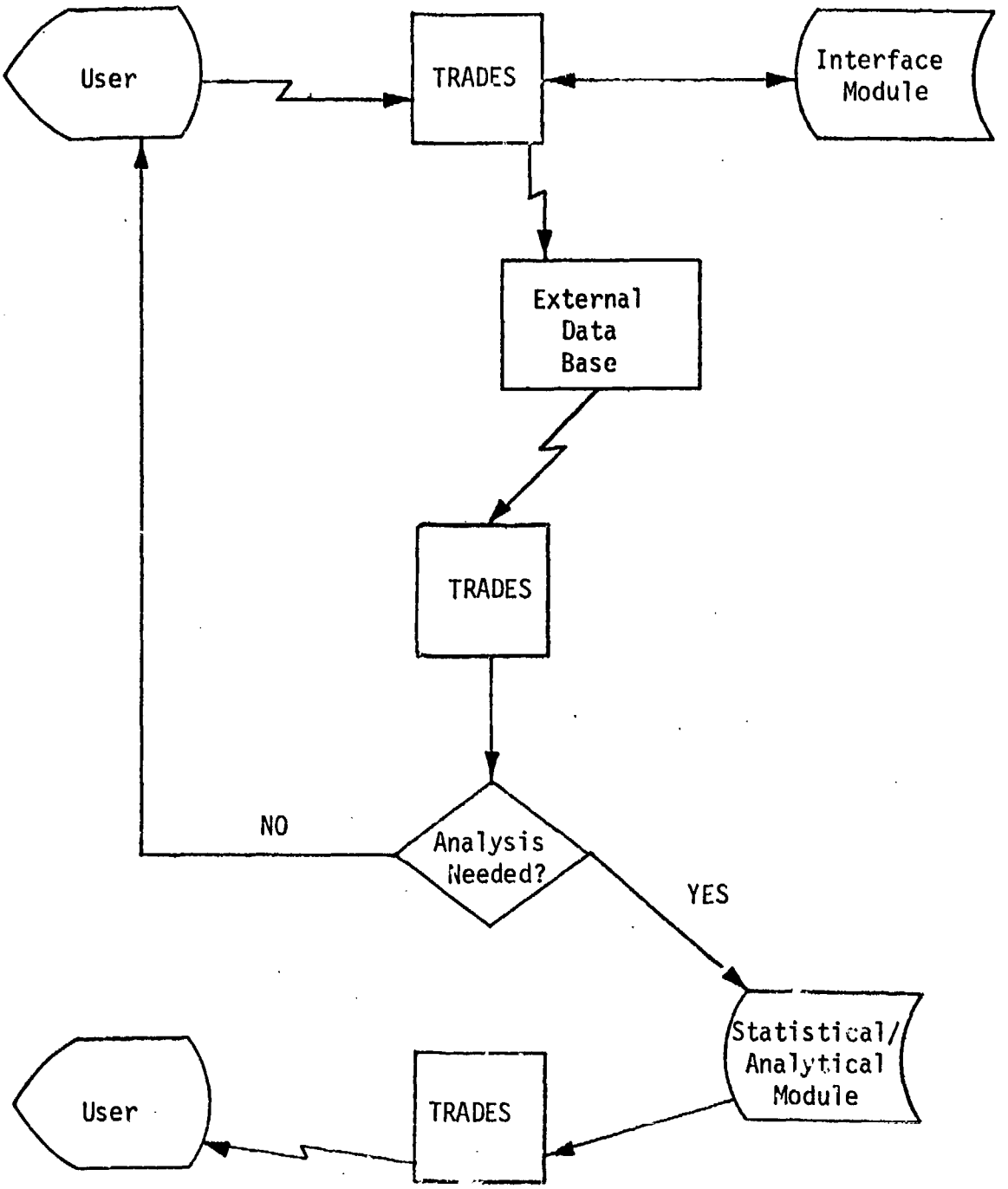


Figure 5-6. Inquiry for Access to Automated Source Data Base

FREQUENCY OF DATA REQUIREMENTS

Based on the investigation performed during the SRD phase of the TRADES concept study, estimates for the frequency of RAM data inquiries from the TRADES system were determined. Table 5-1 is provided with appropriate explanation:

TABLE 5-1. FREQUENCY OF DATA REQUIREMENTS

TYPE ACTIVITY	AVERAGE ANNUAL USE PER ACTIVITY	TOTAL NO. ACTIVITIES	PROJECTED TOTAL ANNUAL USE	
			CALCULATED	ROUNDED VALUE
TRADOC Bds.	45.0	9	405.0	400
TRADOC Centers & Schools	68.8	23	1582.4	1600
TRADOC System Managers	43.3	216* 581*	9352.8 6972.0	9400 7000
Other TRADOC Activ.	94.6	12	1135.2	1100
Selected DA Activ.	58.5	-	**	-
TOTAL TRADOC	-	-	-	19500

* See SRD for underlying assumptions/Frequency of TRADOC RAM Data Requirements.
** Not assessed

The calculation indicates an average of 19,500 TRADOC requirements per year, exclusive of other DA activities who are expected to be frequent users of TRADES. This averages 375 inquiries per week or 75 per work day. If the estimated use from activities outside of TRADOC is as high as anticipated, the average work load could range to between 20,000 and 40,000 actions per year; or between 80 and 160 per day.

Values in Table 5-1 may be high, but are used to adequately size the system. The value of 160 requests per day are estimated to be an outside limit.

The nature of the requests are in support of the types of requirements listed below. These are arranged in descending frequency of order use.

1. Evaluation of established RAM requirements.
2. Test Evaluation.
3. Development of RAM requirements for new system.
4. Test planning/design.
5. COEA.
6. Analysis of fielded equipment.
7. Maintenance manpower and logistics analysis (MMLA).
8. Evaluation of contractor RAM forecasts.
9. Simulations.
10. Ad hoc requirements.
11. Special studies.
12. Technology, state-of-the-art projections.
13. Special task force efforts.
14. Other.

VOLUME OF DATA REQUIREMENTS

The volume of data requirements is estimated for the system based on the chart shown in Table 5-2. These data are representative of the volume of data flow based on anticipated actions by proponents and the relative size of the data base files.

TABLE 5-2. ESTIMATED FREQUENCY AND VOLUME OF TRADES REPORTS

REPORT	FREQUENCY PER DAY	AVERAGE VOLUME (CHARACTERS)*	TOTAL VOLUME (CHARACTERS)
Source Data Inquiries	40	6,000	240,000
Data Extraction and Analysis	2	58,000	116,000
Quick Response Inquiries	35	1,200	42,000
Quick Response Updates	2	1,200	2,400
Mgmt. Update Report	1	30,000	30,000
TOTAL			430,400

*Rounded

Values in Table 5-2 were determined based on estimates derived from the expected data element sizes. The volume of use was derived in the SRD, Page 3-34, and estimated utilization of the capabilities of TRADES by TRADOC RAM engineers. Source identification data and quick response inquiries were based on an average estimate of 75 uses per day. This totals approximately 19,500 requests per year, or 375 requests per week. Although these values may be high, they are used to adequately size the system.

Data Extraction and Analysis reports are based on the typical results of test data, estimating a test report to be 14 pages, 60 lines per page, with 70 characters per line. The Quick Response file is available for results of these manipulations on an as required basis, estimated to be once for each analysis performed.

The Management Update Report represents the necessary management actions to review files for necessary update and deletion of entries from both the Quick Response Module and the Source Identification Module.

TRADES MANAGEMENT BRANCH

The TRADES Management Branch should be a responsibility of the U.S. Army Logistics Center. This recommendation tracks with the responsibility for the LOGC to be the central agency within TRADOC for the guidance and review of RAM related functions.

TRADES functions will reside in two directorates with the LOGC. The responsibilities are divided into a functional element and a data processing support element.

The functional element will be called the TRADES Management Branch. It would be assigned to the RAM/ ILS Division of the Materiel Systems Directorate.

Functions and responsibility of the TRADES Management Branch were introduced in the ACO (Page 2-18), and are further amplified here.

TRADES System Management

This entails the responsibilities which relate to the establishment of the strategy for directing the system, relative emphasis, and development of "where TRADES must go" to be of maximum service. Such management necessarily includes assessment of cost/benefit of all aspects of operations. All management responsibilities for a major data system will reside with this branch. Responsibilities include planning, forecasting resource requirements, insuring that the performance requirements of TRADES are being achieved, and taking necessary adjustment actions to ensure that TRADES is properly managed. Priorities and workloading must be given to the data processing element. TRADES continuing development and enhancement efforts are also a responsibility of this branch.

Methodological and Analysis Support

This function relates to being able to make the maximum legitimate and proper inference from the data and to develop the techniques necessary for this purpose. Further responsibilities are to assist the respective users and effect a proper standardization among the methods of the prospective users. This activity will address RAM analysis techniques and the application of these techniques.

Source and User Service

This area concerns source and user services, to ensure the linkage of desired information with the appropriate source. This function will entail the identification of new sources of RAM information, search in response to inquiries not satisfied by TRADES, and the necessary support when results are unsatisfactory from the automated system.

DATA PROCESSING ELEMENT

The data processing element will function as part of the Planning Factors Management Division of the Operations Analysis Directorate, U.S. Army Logistics Center. The responsibilities inherent within this directorate, for TRADES support, are primarily for programming changes and developing procedures for meeting special requirements generated by users or the TRADES Management Branch. This element also ensures that the automated interfaces with major data bases are kept current and arranges automated interface with other systems as required. It is also responsible for ensuring that the TRADES system is operating on a daily basis.

Another function identified in the data processing area must be considered. These functions include computer management, computer purchasing, services, maintenance contracts, disposal of unneeded equipment, utilization reporting, economic analysis, and ADP budgeting. These functions are performed currently by the OAD of the LOGC.

EXTERNAL SOURCES

These activities are fully described in Chapter IV of the SRD. These sources are an essential ingredient of TRADES and run the gamut from automated data systems to hard copy test results. Automated systems provide information on interactive or batch method to TRADES, as required. It is not anticipated that TRADES will be automatically updated by any of these systems on a recurring basis, but will function by extracting data from sources on an "as required" basis. Results of these data extractions and manipulations will subsequently be stored in the TRADES computer and readily available for further use.

VOLUME OF DATA REQUIREMENTS-USERS

The volume of data requirements is difficult to assess, since the very existence of TRADES will increase the amount, as well as the validity of the flow of R&M information. The chart shown in Table 5-3 reflects the current number of developmental systems which are the responsibility of TRADOC. These activities are related to the TRADOC schools with an average system complexity factor for the typical system developed in that commodity area. This complexity factor was subjectively derived and represents an estimate of system complexity and subsystems/components related to the typical item. (See Table 5-4). This computation provides a yield of the relative flow of data to and from each school, as follows:

ACTIVITY	DAILY VOLUME (CHARACTERS)
Ordnance School	51648
Transportation Center & School	30128
Missile & Munitions Center & School	34432
Quartermaster School	4304
Combined Arms Center	4304
Field Artillery Center & School	43040
Infantry Center & School	30128
Armor Center & School	17216
Air Defense School	25824
Signal School	60256
Engineer Center & School	38736
Intelligence Center & School	21520
Chemical Center & School	8608
Aviation Center & School	60256
Military Police School	Min.
Institute of Military Assistance	Min.
Logistics Center*	Min.
Total	430400

This data is representative of the automated traffic flow which is expected in the TRADES system and is based on a percentage of the activity flow portrayed in Table 5-1.

* Includes only those items for which the LOGC is the proponent.

TABLE 5-3. COMBAT DEVELOPMENT SYSTEMS MATERIEL LOGISTIC RESPONSIBILITY

TRADOC ACTIVITY	LOGISTICS RESPONSIBILITY			
	SYSTEM PROPONENCY	PRIMARY	SECONDARY	NO. OF SYSTEMS TOTAL
Ordnance School	16	125	27	168
Transp. School	82	81	12	175
Missile & Munitions	9	96		105
Quartermaster	33	68	1	102
Combat Arms Center	9			9
A. Nuclear Agency	1			1
Field Artillery	75	7		82
Infantry School	71		1	72
Armor School	34			34
Air Defense	29	2		31
Signal School	107	297	15	419
Engineer School	110	101	4	215
Intelligence	62	9		71
Chemical	55	41	3	99
Aviation	105	2	6	113
Military Police	12		1	13
IMA	16		1	17
LOG Center	12			12
Alaska	1			1
ASD-TRADOC	1			1
ATSC	1			1
Admin. Center	1			1
TOTALS	842	829	71	1742

TABLE 5-4. WORKLOAD COMPUTATION

TRADOC ACTIVITY	WEIGHTED SYSTEMS WORKLOAD*	COMPLEXITY FACTOR a/	COMPLEXITY TOTALS b/	PERCENT WORKLOAD c/
OCS	184	12	2208	12
TSCH	257	5	1258	7
MMCS	114	14	1596	8
QMS	135	2	274	1
CAC	18	14	252	1
ANA	-	-	-	-
FAS	157	12	1884	10
INS	143	9	1287	7
ARMC	68	12	816	4
ADS	60	19	1140	6
SIGS	526	5	2630	14
ENS	325	5	1625	9
INTS	133	15(7)	931	5
CHEMS	154	2	308	2
AVNS	218	12	2616	14
MPS	25	2	50	-
IMA	33	2	66	-
LOGC	24	2	48	-
AKA	-	-	-	-
ASD	-	-	-	-
ATSC	-	-	-	-
SSC	-	-	-	-
TOTAL			18989 d/	100

*Relative system workload based on unit weight for logistics responsible systems and 2 x factor for proponent systems.

a/Subject complexity factors assumed for this study

b/Product of Columns 2 and 3.

c/Percent distribution of complexity totals -Col. 4 (assumed relative workload).

d/ Unique staffing through QAC process reduces estimated RAM workload.

CHAPTER VI

HARDWARE REQUIREMENTS

ANTICIPATED HARDWARE REQUIREMENTS

The equipment portrayed in this chapter represents the basic requirements for TRADES. Most of the Automatic Data Processing Equipment (ADPE) is already available as in the case of DPFO, or is scheduled for purchase, as is the case with PFMD. Those requirements are shown by location in Tables 6-1 and 6-2.

TABLE 6-1. HARDWARE REQUIREMENTS BY LOCATION

	TRADES MGMT. BR.	USERS	PFMD	DPFO
Mainframe Computer				*
Mini-Computer			*	
Line Printers	*	*	*	*
Card Reader			*	
Tape Drives			*	*
Disk Drives			*	*
Micro-Computers or Interactive Terminals	*	*	*	
Security Equipment			*	*
Dedicated Lines	*		*	*
Multiplexers			*	*
Modems	*	*	*	
Plotter	*			
Graphic Terminals			*	
Automatic Dialer			*	

* REQUIRED

TABLE 6-2. HARDWARE OVERVIEW

HARDWARE	CONCEPT CHARACTERISTICS
Mainframe	Time share with DPFO large mainframe computer with batch and interactive capability through terminals
Minicomputer	Utilizes a LOGC minicomputer with multiple terminals capability to handle processing and report dissemination. Estimated need of 2-4 MB of local memory
Line Printer	Use high speed line (600 LPM) printer located at LOGC Computing Center and with each remote terminal
Card Reader	Use 50-200 CPM Card Reader located at LOGC Computing Center
Tape Drives	Use 9-Track tape drives located at LOGC Computing Center and DPFO
Disk Drives	Use DPFOs and LOGC disk drives and disks for support of TRADES. Minimum of 90 MB storage capability initially
Microcomputers or Interactive Terminals	Use microcomputer and any interactive terminal with communications equipment for interactive operations
Security Equipment	Use in-place KG device for I/O transactions
Communications Equipment	Use a 4800 Baud dedicated line from the TRADES Office via the PFDB-TRADE minicomputer office to DPFO and other computer ports for interactive processing
Multiplexers	Asynchronous, minimum of eight (8) communications lines
Modems	Modems and cables as necessary for multiplexer requirement. Also needed with each terminal/minicomputer
Graphics Terminals	Graphics terminals and plotting equipment, preferably color systems, for requirements and performance charting

Located at Fort Leavenworth DPFO are time-sharing computer mainframes with extensive mass storage. At present, these consist of two UNIVAC 1100/82 systems; one for classified processing and one for unclassified processing. These systems are available on a time-share basis with batch or interactive capability through terminals. Both systems are currently operating and have sufficient capacity to handle TRADES on a back-up basis.

One mini-computer will be located at Fort Lee, VA. This mini-computer will be time-shared with the PFDB system. It will utilize multiple terminals to handle report dissemination on an interactive basis. The computer will have its own DBMS, batch terminal, public and private disk packs, a nine-track tape drive, and communications equipment, so that it can operate independently.

It should be noted that the actual equipment specifications for the PFDB will be developed in the 1982-1983 time frame, during its design/development phase. Similarly, the detailed hardware specification for TRADES will be developed in the design/development phase of TRADES.

The primary purpose of the automated data system (ADS) for TRADES is to execute the functions explained in the other portions of the STP. Essentially, the hardware must satisfy both the EEI requirements and the EEA specifications, using the internal and external operating procedures specified therein.

The following discussion of hardware requirements is provided with the intention of specifying to a greater degree, the required characteristics and capabilities of the hardware envisioned in the TRADES concept. It must be recognized that at this stage, estimates of requirements are partly based on assumptions of integration with hardware which will support the PFDB.

Descriptive requirements are in terms of processors, storage media, input and output devices, and communications equipment.

Primary hardware requirements are addressed by location; that is, PFMD, LOGC Computing Center, the TRADES Management Branch, and the typical users. DPFO requirements are not addressed in these terms, since the capabilities and capacities to meet TRADES requirements are essentially available, barring unforeseen growth of TRADES or other users of the DPFO.

EQUIPMENT CONSIDERATIONS

The equipment required for TRADES should be standard, commercially available data processing hardware. Equipment at the user locations should be capable of operation by non-ADP personnel. Because TRADES was designed to avoid special hardware requirements, delays for development of computer associated equipment to handle TRADES are not foreseen.

The TRADES system will operate using central processors, disk and tape storage media, remote output and input devices, and will utilize appropriate communication equipment for a partially distributed data system.

Power Requirement

Commercial power sources will be used to provide operating electricity. Since TRADES will operate in a CONUS-base environment, not under combat conditions, local generating power is not required. Back-up emergency battery power is required, however, to prevent loss of data and equipment malfunction due to unexpected power interruptions. Consideration will be given to equipment that is energy conservative.

Climatic Considerations

No unusual requirements are noted, due to the operating environment. The equipment, in general, must perform in a normal office building environment.

Transportability

The terminals (CRT and keyboard), modem, and line printers at user locations should be lightweight, and be able to be carried by two personnel, to facilitate movement from one office to another. These devices shall not require extensive rewiring of buildings, and should be accommodated by a 120 volt power source and Autovon/Federal Telephone Service (FTS) telephone.

Nuclear, Biological, Chemical (NBC) Survivability

No special standards are specified for this system since it is not anticipated to operate in an NBC environment, nor is it deemed essential during periods of attack on CONUS facilities.

Personal Safety

The devices should be constructed and installed in such a manner as to preclude electrical and mechanical hazard to the operator, thus providing maximum safety.

PROCESSORS

Central processing units are required at DPFO and the LOGC, Planning Factors Management Division. The central processor at the LOGC for PFMD is assumed to have the following capabilities, which will meet the TRADES requirements:

1. Sufficient processing capacity to process both Planning Factors inquiries and job-runs, as well as TRADES, on an interactive and time-share basis.
2. The computer must be capable of sustained operation for a minimum of eleven hours a day.
3. The Control Processing Unit (CPU) must be able to accept input transactions from a minimum of 40 remote sites (maximum of eight concurrently), and an average of 75 requests per day for TRADES.
4. The CPU must be able to manipulate data on an interactive/rapid response basis, and perform arithmetic-logic functions, as programmed.

5. The CPU must also have a floating point capability for higher mathematical functions. Additionally, a capability must exist to accept a commercial/ governmental statistical software packages commonly available (typically, Fortran programs).

6. The CPU should have a minimum of 2-4 megabytes (MB) local memory for logical operations.

7. Likely system characteristics include a 32-bit virtual memory system, 16 32-bit general purpose registers, 32 interrupt priority levels, 12K bytes of writable diagnostic storage, 8K bytes write-through memory cache, console subsystem, intelligent micro-computer, main memory of 512K Bytes plus 1.5 MB add-on, synchronous back plane interconnect, 176 MB disk drive with controller, magnetic tape 800/1600 BPI 45 IPS-9 track, hard copy terminals, 8-channel communications multiplexer, hardware bootstrap load, battery back-up time-of-day clock with bootstrap load, standard operating system and text editor, graphic capability, and associated plotting equipment. It is stressed that this capability is shared with the PFDB.

STORAGE AREA

Computer on-line disk storage random access capabilities are required for all modules, except for the Management Module corporate history files, which may be placed on magnetic tape (or equivalent) for indefinite storage. The TRADES requirement for 80 megabytes must be accommodated with anticipated disk storage devices for PFDB. If necessary for later expansion (which could conceivably be of the order of 900 megabytes), dedicated drives and disks may be needed. Although the terms "disks and tapes" are used for explanatory purposes, consideration of greatly improved state-of-the-art devices will enhance the storage capabilities of the computers, and should be considered at that time.

It is anticipated that the selected computer system will have a virtual storage capability. This capability will enable programming to be performed without concern as to whether the program fits within the space provided for the primary storage. It

also uses all available storage space when executing jobs. This storage gives great flexibility for systems such as TRADES, which will be time-sharing with PFDB.

INPUT DEVICES

The central computer must have the ability to receive input from a variety of input devices. The prime methods of inputting data include punched cards, magnetic disk (computer-to-computer), magnetic tape, interactive remote terminals, and remote micro-computer.

Punched Card Reader

A punched card reader is assumed to be part of the PFMD. No remote user will require this capability. This reader should have a minimum capability of reading data into the computer at a speed of 300 cards per minute.

Disk Packs

Disk packs are read by the computer. The normal peak transfer rate and access time used in commercial devices is adequate for the TRADES system. (A representative manufacturer today uses 806 KB peak transfer rate and 38.3 ms average access time.)

Also, computer-to-computer transfer of data capability is required (to include both hard and floppy disks) which could be disk-to-disk, disk-to-tape, tape-to-tape, or tape-to-disk.

Magnetic Tape

Magnetic tape is machine-readable, and is convenient for storing and mailing large amounts of data. An average tape of 2400 feet has the ability to store 14 megabytes of characters, and is relatively inexpensive. Therefore, the frequent use of tape is anticipated when obtaining data for analysis.

The PFDB system will have a magnetic tape drive, which has the capability referred to in the processor paragraph. It is anticipated that another tape drive will not be required for the exclusive use of TRADES. However, if response to the user is slow, TRADES should be prepared to augment with an additional drive.

Micro-Computer

Micro-computers will be used in lieu of interactive remote terminals by the PFMD, the TRADES Management Branch, and selected TRADOC primary users. The micro-computers need to be equipped with modems, and the necessary communications equipment to enable the micro-computer to be used for direct input to the TRADES central processor. Capacities needed are dependent on the workload at those locations. The TRS-80 in the RAM/ILS Division and the anticipated micro-computer at PFMD are deemed adequate for those activities.

Interactive Remote Terminal

This terminal will be located with the primary school/center users. These devices, consisting of a keyboard and CRT (and line printer) are used to access the PFMD and DPFO central computers. They cause the data to be manipulated and also enable the entry of selected data into the computer. Speed requirements for the terminal are 4,800 bits per second, considering that most transmissions will be performed over commercial lines; this transmission rate is subject to review during the design/development phase.

OUTPUT DEVICES

Most of the input devices previously mentioned also serve as output devices. These include card punches, disk packs, magnetic tape, micro-computers, interactive remote terminals, and line printers.

Card Punch

Card punch machines may be needed, and are available in the LOGC Computing Centers. Normal commercial standards apply.

Disk Packs

Disk packs previously mentioned may be used as an output device. This use will be primarily for disk-to-disk operations. Capabilities previously described apply.

Magnetic Tape

Magnetic tape is used as a common vehicle for transmitting data to and from computing facilities. Previously indicated standards apply.

Micro-Computers

Micro-computers may be used as an output device. The micro-computer may use internal storage devices, such as internal memory or floppy disk devices. Many micro-computers have a relatively limited storage capability, and care should be taken to ensure that these limits are not exceeded.

Interactive Remote Terminals

These terminals serve as the most common output device at user locations. The device will typically use a CRT or other display to provide information to the operator. Upon command, hard copy reports are provided to the user via an attached printer.

Line Printers

This device will provide printed output at remote locations, TRADES Management Branch, and PFMD. The print capability should be 132 characters per page, multiple (4) copies required, if necessary, for each report.

Graphics Terminal

Already anticipated to be part of the PFDB system, the graphics terminal is required for plotting of graphs, trend lines, mathematical functions, etc. This capability is required at the PFMD, and can serve all users. Plotting can also be done using the line printer at remote locations.

COMMUNICATIONS

Communications equipment requirements are needed to tie the system together. At the central location, an additional 8-channel communications asynchronous multiplexer (up to 9600 Baud) will be required, along with necessary modems to accomplish this task. The primary function of this equipment is to enable multiple use of the computer

by several remote inquiries occurring simultaneously. It is estimated that no more than eight remote inquiries will occur at any one time. The computer should be expandable to a maximum of 48 lines, if needed, to accommodate growth of both TRADES and PFDB. Integration of TRADES with tactical communications network is not required.

Modems (and cables) will also be needed with each remote terminal and micro-computer, and for the asynchronous multiplexers. This function provides for connection of asynchronous interfaces or terminals having Electronics Industry Association interfaces.

Communications Lines

A dedicated line is required between the TRADES Management Branch terminal and the PFMD computer, and a dedicated multiplexed line between the LOGC computing Center and DPFO. All other communications lines can be served using Autovon/FTS, or standard commercial circuits.

SECURITY

Security equipment requirements will be accommodated by secure facilities presently located at TRADOC installations (KG-13 devices are in use for this purpose). The current amount of classified is relatively low; therefore, this approach is sufficient for the foreseeable future. TRADES terminal will not be required to handle classified materiel.

SUMMARY

The hardware selected for TRADES satisfies the Essential Elements of Analysis (EEA) required by the SRD. The availability of terminals to all RAM users provides ultimate accessibility to the TRADOC community. Flexibility is maximized with the provision of both interactive and batch processing capability. The large scale computers and communications equipment selected permit maximum integration

of TRADES with other systems. Growth potential is high due to the back-up capability of storage and CPU at the DPFO. Resource requirements are not significantly different than other systems considered, and maximize utilization of sunk costs of hardware, facilities, and personnel in being or programmed for acquisition by 1985. Implementation Time is reduced by this approach, since it is linked to the utilization of equipment presently available or programmed for acquisition. Security of data base is provided for by the use of secure lines and encipherment (as required) and scrambling techniques currently available.

CHAPTER VII

SOFTWARE REQUIREMENTS

GENERAL

The ensuing section will address the software requirements of TRADES in terms of the five functional modules which constitute the total system. These modules whose internal operating characteristics are described in detail in Chapter IV are the:

1. Source Identification Module,

2. Quick Response Module

3. Interface Module

4. Statistical/Analytical Module, and

5. Management Module.

The general software structural approach, which has been applied to the design of each of the modules, is shown in Figure 7-1.

The following describes the software and its functions. Command or data inputs by users or sources will be verified in a preprocessing function. Any errors detailed will be reported back to the user/source for corrective actions. These errors will be reported either in hard copy printouts or visual display media. Verified commands will then be executed and data stored or manipulated through use of a DBMS or analysis routines.

Several DBMSs are available on the commercial market that are sufficient for the TRADES system. These are systems similar to System 2000, DMS, (both available at DPFO), TOTAL, IMS and a host of others. Since System 2000 is already available at DPFO, it is recommended for implementation with TRADES. With respect to the DBMS for the VAX 11/780 at PFMD, it is recommended that a more recently developed "Relational DBMS" be implemented.

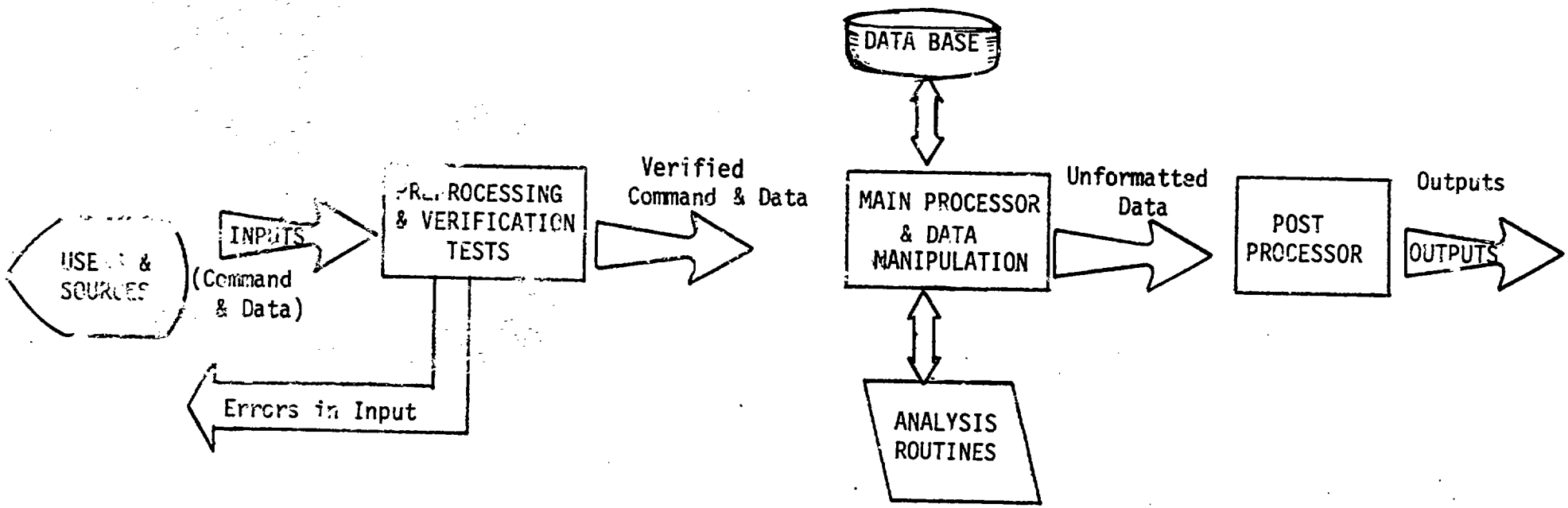


Figure 7-1. General Software Structural Approach

Examples of "Relational DBMS" are INGRES (Relational Technology, Inc.), and ORACLE (Relational Software, Inc). The advantages of these relational systems are that they provide high level of query language capability, easier use, and greater flexibility in modification of data definitions.

Finally, data retrieved from the data base or analytical manipulation will be presented to the user as structured output from a report generator. Interface processing will also be provided where required. Both the report generation and interface capabilities will be contained in the Post Processor.

User Prompting

User prompting is a technique which allows the computer to become user friendly. It involves an interactive conversation with the computer such that the user will be prompted or guided to respond to a logical and most useful response.

The two methods of prompting most frequently used are: (1) menu selection, where a list of items are presented and the user is asked to select one; and (2) a single question with logical choice displayed in a manner which allows the user to select it by a single key stroke or return function.

EXAMPLE:

Computer: Select a statistical/analytical package from the following list:

1. Multiple Regression
2. Multiple Stepwise Regression
3. Chi-Square Test
4. Student t-Test

Number Picked by User? 3

Language Requirement

The language used to develop the TRADES system should be selected on the basis of it being able to run, as a minimum, on both the VAX 11/780 located at PFMD and the UNIVAC 1100 located at DPFO to avoid cost of software development for two or more systems. Further, the language should be interoperable with the DBMSs located on these DPFO and PFMD computers.

Lastly, most serious consideration should be given to using the same computer language for TRADES as that used for the PFDB. This will be beneficial in design, development, implementation and maintenance of TRADES in terms of cost and effectiveness of operations, i.e., it would be more difficult to develop and maintain systems having different languages at a single facility.

Selection of a higher order structured language should also be considered over FORTRAN or COBOL because of its advantages in post implementation support and ease of maintenance.

Source Identification Module

Software developed for this module will provide the TRADES user with information of sources of RAM data and allow query by a taxonomy including commodity, end item, major system/subsystem, and selected components levels. The following describes the software required to accomplish this function:

1. Preprocessor. This software will verify query commands to the data base management system. Also, the software will prompt the user to enable more efficient query of data and more specific reports.

2. Main Processor. The software for the main processing of source identification data will be that of a DBMS. Access language to the DBMS will be that peculiar to the system acquired and implemented.

3. Post Processor. Software for the post processor will provide:

   (1) Agency and/or activity with appropriate RAM data holdings.

(2) Extent of holdings (years of information, number of test reports, total number of records, etc.)

(3) Form of data (test reports, raw field data, reduced data, analysis results, etc.) at activities.

(4) Environmental conditions (e.g., peacetime versus combat, geographical area, arctic versus tropical, desert versus cultivated areas, etc.)

(5) Point of contact.

(6) If automated data base:

a. Accessibility through user terminal.

b. Necessary passwords, machine interface, baud rate, etc.

c. Protocol and procedures for obtaining data.

d. Description of file layouts (essential elements of information (EEIs) in each field of data).

e. Necessary identification and definition of terminology to provide the user with information relative to user requirements which may be matched by the data base.

This software shall propose reports either in fixed format of summary data or on a query-by-query basis.

Additional software is required to trigger the "automatic dialer" equipment to access the Defense RDT&E On-Line System (DROLS) automatically through the TRADES system. This software will notify user if access is not available at the time and will allow user to terminate or continue query. (See Appendix C)

Quick Response Module

This module provides an immediately accessible value for each applicable EEI (and the conditions under which it was derived) for the system. The values represent the best technical estimate for the EEIs based on all available data for the system. The values contained in the Quick Response Module are updated by the TRADOC proponent agency upon the availability of more current/more accurate data as the system progresses through the life cycle.

The following describes the specific software requirements for this module:

1. Preprocessor. Software will be required that will allow query commands to be verified and user prompting to allow efficient responses.

2. Main Processor. Similar to the Source Identification module, the software for the Quick Response Module will be that of a DBMS and access determined by the particular DBMS query language. The DBMS will be structured in accordance with the taxonomy from commodity through selected component levels with associated "acceptable values."

3. Post Processor. The software required will be a report writer capable of producing either fixed formatted summary or individual query-by-query reports.

Interface Module

This module will contain the necessary information to communicate with the diverse computers having RAM data bases within DA (or other military services). Access to the Interface Module will be indicated by the Source Identification Module, depending on the specific user requirements and source identification. To the extent feasible, this module will contain software to provide the user with a basic vehicle for extracting, analyzing, and formatting outputs from automated data sources.

The following describes the software requirements for this module:

1. Preprocessor. Software will be required that will allow query commands to be verified and user prompting to allow efficient responses.

2. Main Processor. Since the automated data base will be identified by the Source Identification Module that was previously queried, query will be by the data base name or abbreviation (e.g. COMRAM, SAMS, TMIS, etc.). The main processor software requirement will be that of a simple sequential file with detailed information on each automated data base containing the appropriate RAM data.

3. Post Processor. The report generator will simply list the appropriate data base name or abbreviation and print all information required for access and usage.

Where an identified data base is designed for interactive processing, this software will allow automatic access through use of the "automatic dial up" equipment. Similar to access to the DTIC system, the software will be designed to notify the user of queues or busy ports to these data bases so that the user may leave job in queue for future processing.

Statistical/Analytical Module

The objective of the Statistical/Analytical Module is to facilitate RAM analysis, perform tests of hypotheses, determine whether the effect is due to chance, whether there are trends, and assess the stability of observations.

The software requirements to accomplish this objective are detailed as follows:

1. Preprocessor. Software in the preprocessor will provide for selection by the user of various statistical/analytical packages contained in this module. These will be presented by name of the particular statistical/analytical function along with a short abstract of the methodology or technique in a tabular format.

2. Main Processor. Once a particular package has been selected, the preprocessor software will provide the input data set up requirements for that package. Raw data files will be formatted to fit input data requirements for each package through a software section capable of tailoring the raw data for that particular statistical/analytical package.

The main processor will also contain all of the statistical/analytical packages. As an example:

a. Analysis of variance

b. Analysis of covariance

c. Data Transformations

d. Distributions and Processes

(1) Normal

(2) Binomial

(3) Gamma

(4) Chi Square

(5) Weibull

(6) Log Normal

(7) Exponential

(8) Poisson

e. Utility Routines

(1) Matrix Operations

(2) Plotting

f. Time Series Analysis (Arima)

g. Descriptive Statistics

(1) Central Tendency and Moments

(2) Curve Fitting

h. Regression (univariate and multivariate)

i. USALOGC RAM Rationale Methodology.

Finally, this processor will allow execution of the statistical/analytical package with appropriately formatted raw data.

3. Post Processor. The post processor software will be capable of providing appropriate outputs resulting from runs made of the statistical/analytical package. Further, this processor will keep an audit of the methods used and resulting data in a summary file (History Section of the Management File) by time, date, and user such that the statistical process could be reconstructed at a later date.

Management Module

The function of the Management Module is to provide a means for the TRADES Management Branch and proponents to administratively manage the TRADES system. It achieves three basic purposes:

(1) Provide management data for control and development of TRADES.

(2) Provide a historical file of TRADES utilization, guidelines, and changes in TRADES, and procedural notes.

(3) Provide for scheduling the updates of the other modules within TRADES on a regular basis.

1. Preprocessor. This software will provide capability to retrieve historical and summary data contained in a data base of the following information:

a. Additions, deletions, changes - Interface Module - software.

b. Additions, deletions to Quick Response

c. Additions, deletions, changes to references to Source Identification Module (to include EEIs).

d. Additions, changes, improvements to Statistical/Analytical Module.

e. Inputs from proponents. The preprocessor will allow historical and summary review of changes to the Quick Response Module and allow user "short notes" to be filed under user name.

2. Main Processor. The software requirements here will be for a file of changes to each of the five modules described for the TRADES system for the purpose of auditing usage data. Also, file space will be established for "short notes" to be kept under a particular user name. The overall TRADES software will be structured such that the management module will be accessed for every action prior to entry into any of the other modules.

3. Post Processor. The software required will enable module usage and data update audit reports. Also, recommendations for updates to proponents will be automatically produced for particular data on a periodic basis. Software capable of printing user "short notes" by name, date, time and subject will be developed and implemented for analysis re-creation capability. Finally, the post processor executes proponent inputs.

CHAPTER VIII

PERSONNEL REQUIREMENTS

GENERAL

The additional personnel required to operate TRADES are summarized in this chapter. These personnel estimates are based on comparisons with other systems, analysis of projected workload, and discussion with RAM engineers and data processing support personnel.

This discussion addresses the operation of TRADES to include TRADOC users, TRADES Management Branch, data processing element, and data source personnel. The assessment on data source personnel is not complete since analysis was not performed within these activities in depth. However, assumptions on workload are made which can assist data source management to identify impacts upon organization computer and functional personnel resources, as TRADES reaches the implementation stage.

USER REQUIREMENTS

Major consideration is given to the effect of TRADES on the principal system users. The big question is, what will be the workload effect of TRADES on the combat development activities in the TRADOC centers and schools. One conclusion reached by the APJ team during the investigation phase of the concept study, was that a large amount of the RAM engineer's time (up to 50% in some cases) was spent in locating sources and obtaining data. These two functions are addressed directly by TRADES, with the anticipated effect of freeing up at least a portion of the RAM engineers' time.

On the other hand, the users assume a monitoring and control role for a portion of the TRADES system.

The professional engineer will have more data available under TRADES, which may enable the performance of functions that were previously not performed, based on non-available information. In essence, the time saved by TRADES will provide the tools to enable the RAM engineer to do a better and more complete job.

Reference is made to the workload calculation prepared in Chapter V, Table 5-4. The assumption is made that each end item, subsystem, component, and test and support system would generate from one-half to one hour's activity by a RAM engineer using the TRADES system, per year. Also, assuming that there are 251 work days available in a typical year, and 68% of this available time is projected for direct labor; 1365 hours of direct labor will equate to one man year of effort. The results of this calculation are portrayed on the chart in Table 8-1, which yields a high and low range based on these estimates. The total requirement is for 7 to 14 personnel, based on either the high or low range estimate. Recommended staffing level is 9.

The quantity and skill level recommended for the combat development activities which require them are portrayed in Table 8-2. The education level should be a minimum of a bachelor's degree in engineering or in the physical or mathematical sciences. Experience/training with computers and computer systems is highly desirable.

TRADES MANAGEMENT BRANCH

1. TRADES System Manager - The proper management of the TRADES system will require a TRADES System Manager of appreciable management experience and engineering skills. Qualifications include a thorough understanding of TRADES, RAM methodologies, the TRADOC combat development system and its relationship to the Army, and the availability of appropriate source data flows. Probable educational background implies significant formal training in statistics/statistical methodology, in addition to engineering skills. Approximately six to ten years of government experience, system management of at least one automated system, or significant experience in the planning and operation of such systems.

2. Methodological and Analysis Support - Two Analysts/ Statisticians are required. These personnel are primarily concerned with RAM methodology and techniques. Required educational background includes a masters degree or better in mathematics/statistics, and preferably with a minor or equivalent in

TABLE 8-1. USER PERSONNEL REQUIREMENTS

USERS	HIGH	LOW	RECOMMENDATIONS
OCS	1.6	.8	1
TSCH	.9	.45	1
MMCS	1.2	.6	1
QMS	.2	.1	0
CAC	.2	.1	0
ANA	-	-	0
FAS	1.4	.7	1
INS	.9	.45	1
ARMC	.6	.3	0
ADS	.8	.4	1
SIGS	1.9	.95	1
ENS	1.2	.6	1
INTS	.7	.35	0
CHEMS	.2	.1	0
AVNS	1.9	.95	1
MPS	-	-	0
IMA	-	-	0
LOGC	-	-	0
AKA	-	-	0
ASD	-	-	0
ATSC	-	-	0
SSC	-	-	0
	-	-	0
TOTALS	13.7	6.85	9

TABLE 8-2. TOTAL TRADES TRADOC PERSONNEL REQUIREMENTS

USERS	DESCRIPTION	QTY
OCS	General Engineer (RAM)	1
TSCH	General Engineer (RAM)	1
MMCS	General Engineer (RAM)	1
FAS	General Engineer (RAM)	1
INS	General Engineer (RAM)	1
SIGS	General Engineer (RAM)	1
ENS	General Engineer (RAM)	1
AVNS	General Engineer (RAM)	1
ADS	General Engineer (RAM)	1
TRADES MANAGEMENT BRANCH		
LOGC	Supervisory General Engineer (RAM)	1
LOGC	Analysts/Statisticians	2
LOGC	Computer Specialist (Sys Anl)	1
LOGC	General Engineer (RAM)	1
LOGC	Clerk Typist	1
DATA PROCESSING ELEMENT		
LOGC	Senior Programmer	1
SOURCES		
No quantified estimates have been made.		
	TOTAL	16

physical sciences or engineering. Professional experience should include three to six years of system analysis involving inferences from data and an ability to handle computers.

3. Source and User Services - These positions require one General Engineer (RAM) and one with educational background of at least a bachelor's degree, and three years analysis experience.

4. Clerical support is provided by a single clerk, and should ideally be a "career progression" job. The work level may ultimately justify two personnel in this area.

These personnel, as described in Chapter V, would be assigned to the RAM/ILS Division of the Materiel Systems Directorate, LOGC.

DATA PROCESSING ELEMENT STAFFING

This element requires a senior programmer to serve as the point of contact in the Operations Analysis Directorate for TRADES. Programming changes and other special requirements would be a part of this function. Educational experience should include at least a bachelor's degree in computer science, with additional training in analysis. Three to five years experience in computer programming/ systems analysis is considered essential.

Other support personnel in OAD are considered to be sunk costs, with computer services provided by the Computer Support Division.

DATA SOURCES

It is conceivable that the development and implementation of TRADES will place some additional workload on data sources; particularly in the developmental phases of TRADES. While these cannot be precisely estimated at this time, it is probable that the development of the Interface Module will require some detailed coordination of source computer support personnel with the TRADES system designers and programmers. Further, initial testing and loading of data will have some impact on functional personnel. However, subsequent experience in the use of TRADES should reduce the personnel impact

as proficiency is attained and interactive processes used to the maximum extent possible.

An additional function to be performed by the TRADES office will be the development of new data and provision of customer service. Analysts will assist in the validation of new or updated RAM data on a continuous and controlled basis before entry into the TRADES and provide customers (with or without terminals) with periodic reports of changes or modifications to TRADES in terms of data, hardware, software, management, procedures, and regulations.

PERSONNEL SELECTION

The skills and professional and educational backgrounds portrayed herein and in Chapter II of the ACO are an essential portion of TRADES. Careful selection of these personnel is imperative to the efficient operation of the system.

CHAPTER IX
CONCLUSIONS

GENERAL

This chapter presents conclusions relative to the system technical characteristics developed in this part of the study. Corresponding recommendations are given in Chapter X.

RAM DATA REQUIREMENT

The implications of accurate forecasting of RAM requirements is a significant driver in the Army's entire cost of doing business. (Careful structuring of reliability requirements has major implications for the mission effectiveness and life cycle cost of materiel.)

TRADES DEVELOPMENT

This STP has outlined a system that is technically feasible, economically viable, and clearly essential to take full advantage of the vastly improved RAM data sources currently under development by the Army. (The advent of SAMS and CTDCS, and technological advances in other areas supported by automated data systems, provide expanded data to the RAM engineer to monitor developmental and fielded systems, make valid comparison of reliability data on a life cycle basis, and establish requirements based on solid knowledge of current and past experience.)

TRADES DEVELOPMENT PROCESS

A series of management actions (set forth in Chapter X) must also be taken to ensure continuity of the TRADES development process.

EXTERNAL TRADES
SYSTEM DEVELOPMENT

The approved TRADES ACO takes maximum advantage of available LOGC personnel and equipment by development under the PFDB umbrella. It should ultimately be a basic module of the total PFDB capability.

INTERNAL TRADES
SYSTEM DESIGN

TRADES is designed to take maximum advantage of state-of-the-art DBMSs and languages. TRADES may minimize new software development to the extent possible by using PFDB common software and language. However, the use of high order languages should be investigated to reduce post-development software support and provide maximum ease of use of the capabilities of TRADES.

TRADES IMPLEMENTATION
MILESTONES

With the completion of concept development, there will be sufficient information and structure to proceed to system definition and design, system development and deployment.

TRADOC TEST DATA

There is currently no common automated system within TRADOC to capture raw data from tests performed within TRADOC. There is a requirement that these test results be an integral part of TRADES and available on an interactive basis, particularly during the conduct of tests and to maintain an audit trail of past efforts.

CHAPTER X

RECOMMENDATIONS

GENERAL

This chapter presents recommendations based on the conclusions arrived at in Chapter IX and on the results presented in Parts III and IV. Specific recommendations are as follows:

RAM DATA REQUIREMENT

Continue the development of TRADES. There is conclusive evidence that the system is needed by the combat development community, with a high probability.

TRADES DEVELOPMENT

Initiate appropriate life cycle management actions to expedite system development in accordance with AR 18-1 and TB 18-100. These actions include:

a. Appoint a Project Officer for TRADES

b. Prepare a charter which contains the specific authority and responsibility of the PM for getting the system developed and deployed.

c. Prepare a System Decision Paper (SDP) to formalize completion of the Concept Development Phase of the TRADES automation life cycle.

d. Develop a Management Plan (MP) within 120 days of appointment of the PM.

e. Designate the RAM/ILS Division of the U.S. Army Logistics Center as the Functional Proponent (FP) and Proponent Agent (PA) for TRADES for functional development of TRADES.

f. Designate the Planning Factors Management Division of the Logistics Center as Assigned Responsible Agency (ARA) for technical development of TRADES. This includes responsibility for production of ADP software that automates the functional system.

TRADES DEVELOPMENT
PROCESS

Initiate management tasks necessary for the TRADES development process:

a. Organize a TRADES Management Branch during FY 1983. This branch would assume program management functional responsibilities for TRADES.

b. Prepare an Army regulation to support data requirements and management responsibilities for the formalization of TRADES.

c. Take full advantage of sunk costs by LOGC and TRADOC in the programming and implementation of TRADES.

d. Plan an implementation date of early 1985 for the developed TRADES System.

e. Plan necessary personnel augmentation to proponents.

EXTERNAL TRADES
SYSTEM DEVELOPMENT

Continue necessary actions to bring TRADES into synchronization with PFDB as rapidly as possible. These actions include the following:

a. Initiate a functional description in detail equivalent to the DFSR.

b. Initiate data collection activities for hard copy reports, for both source identification and to avoid loss of data. Action should be taken to identify, inventory, assess, and render accessible hard copy information within the TRADOC community.

c. Initiate a prototype/pilot TRADES program to capitalize on the hard copy development actions indicated in b. above, in a sequence as outlined on pages 2-16 and 2-17 of the ACO.

INTERNAL TRADES
SYSTEM DESIGN

Apply the following concept and strategy in internal TRADES system design:

a. Use the TRADES logical and modular concept structure developed by the STP.

b. Insure that TRADES remains portable in its design and development characteristics to ensure that it is not bound to one specific set of hardware.

TRADES IMPLEMENTATION
MILESTONES

Implement a milestone sequence for TRADES, with intervals corresponding to the following baseline schedule:

Item	DO/OR START	COMPLETE
Appoint PO	Jan 82	
Prepare Charter	Mar 82	May 82
Prepare SDP	Feb 82	Mar 82
Prepare Management Plan	Jan 82	May 82
Designate [illegible]	Apr 82	
Designate ARA	Apr 82	
Initiate FD	Dec 81	Aug 82
Organize TRADES Management Branch	Sep 82	
Initiate Data Collection (Joins PFDB/TRADES)	Sep 82	Mar 85
Initiate Pilot Program (Joins PFDB/TRADES)	Sep 82	Mar 85

(continued)

(Schedule concluded)

Prepare Development Contract	Sep 82	Dec 83
Prepare Army Regulation	Jan 83	Jan 84
Develop System	Jan 84	Mar 85
Accept System - Initiate Operations Merge Pilot Programs	Mar 85	

TRADOC TEST DATA

Initiate effort within TRADOC to implement a standardized data collection system which will provide computerized data from TRADOC test activities for use in TRADES.

APPENDIX A

LIST OF REFERENCES

The following constitutes a list of key references consulted during the investigation and development of the system technical paper for TRADES.

The references are organized by major RAM data sources, followed by general publications and other data sources.

LSAR

1. DARCOM-P 750-16, "Maintenance of Supplies & Equipment - DARCOM Guide to Logistic Support Analysis", June 1980.
2. MRSA Publication, "A User's Guide for Logistic Support Analysis Record (LSAR) Release Two-Automatic Data Processing System", March 1981.
3. MRSA Publication, "LSAR Optional Systems Functional & ADP Guide", March 1981.
4. MRSA Publication, "LSAR ADP Guide for Functional Personnel", September 1980.

TECOM

1. DTIC Demand Bibliography, Search Control No. 004500, "Army Test & Evaluation Command Reports".

CTDCS

1. DARCOM Publication, "Common Test Data Collection System - General Functional System Requirement", 9 November 1979.
2. DARCOM Publication, "Common Test Data Collection System Specification", July 1980.

COMRAM

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2. OTEA Publication, "Catalog - USAOTEA Test Documentation 1973-1979".

TAERS/TAMMS

1. TM 38-750, "The Army Maintenance Management System (TAMMS)", May 1981.

SDC

1. AR 750-37, "Maintenance of Supplies and Equipment - Sample Data Collection - The Army Maintenance Management System (TAMMS)", 2 May 1977.

2. DARCOM Supplement 1 to AR 750-37, "Maintenance of Supplies and Equipment - Sample Data Collection - The Army Maintenance Management System (TAMMS)", 17 September 1979

SAMS

1. HQs DA Publication, "Executive Summary - Standard Army Maintenance System (SAMS) - Maintenance Program Operations Management (MPOM)", May 1980.

2. TM 38-121-2, "Functional Requirements for Standard Army Maintenance System Maintenance Operations Management (MOM) (SAMS-1) Executive Summary", April 1981.

3. TM 38-L26-2, "Executive Summary of Functional Requirements - Standard Army Maintenance System (SAMS) - Retail Level - Maintenance Program Operations Management (MPOM) (SAMS-2)", October 1980.

4. USALOGCEN Publication, "SAMS-3".

5. Record of Meeting - Standard Army Maintenance System (SAMS) Wholesale Level In-Process Review Conference, St. Louis, MO, 10-12 April 1979.

General Information

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2. DoD Inst. 5000.39, "Acquisition and Management of Integrated Logistics Support for Systems and Equipment", 17 January 1980.

3. DoD Inst. 5000.40, "Reliability and Maintainability", 8 July 1980.

4. AR 18-1, "Army Automation Management", 15 August 1980.

5. AR 70-10, "R&D Test & Evaluation During Development and Acquisition of Materiels", 29 August 1975.

6. AR 335-15, "Management Information Control System", 15 March 1978.

7. AR 700-127, "Integrated Logistics Support", 1 April 1981

8. AR 702-3, "Army Materiel Reliability, Availability, and Maintainability (RAM)", 15 November 1976.

9. Draft AR 702-3, "Army Materiel Systems Reliability, Availability, and Maintainability (RAM), 23 July 1981.

10. FM 101-10-1, Staff Officer's Field Manual Organizational, Technical and Logistic Data (Unclassified Data)", July 1976.

11. TB-18-106, "Deployment, Operations and Termination of Automated Data Systems", September 1980.

12. SB 700-20, "Army Adopted/Other Items Selected for Authorization/List of Reportable Items", July 1980.

13. TRADOC Pam. 71-12, "Combat Developments Staff Officer's Handbook", November 1979.

14. TRADOC Reg. 700-1, "Integrated Logistic Support", 15 July 1977.

15. TRADOC/DARCOM 70-2, "Material Acquisition Handbook", January 1980.

16. USALOGCEN Printout, "TRADOC Developmental Hardware Projects" (Para. 3 of TRADOC Reg. 700-1 Para. 11), 2 June 1981.

17. BDM Services Company, "Final Report - Design and Development of a Planning Factors Data Base (Phase I)", Volumes 1 through IV, 31 May 1979.

18. APJ 892-2, "TRADOC RAM Data Evaluation System (TRADES) (ACN 51735)", System Requirements Description, July 1981.

19. APJ 892-3 "TRADOC RAM Data Evaluation System (TRADES) (ACN 51235)", Alternative Concepts of Operation, September 1981.

20. TB 18-100, Army Automation Life Cycle Management, August 1981.

APPENDIX B

AGENCIES/PERSONNEL CONSULTED
DURING THE STP DEVELOPMENT

ACTIVITY	LOCATION	PERSON CONTACTED
Operational Test & Evaluation Agency	Falls Church, VA	R. Briggs
USA Ordnance Center & School	Aberdeen Proving Ground, MD	T. Saponaro
USA Signal Center & School	Ft. Gordon, GA	R. Kidd
Operations Analysis Directorate, USA Logistics Center	Ft. Lee, VA	F. May G. McBryde P. Jacobsen
Materiel Systems Directorate, USA Logistics Center	Ft. Lee, VA	D. Lindquist
Data Processing Field Office	Ft. Leavenworth Kansas	MAJ Timmons
BDM Corporation	Norfolk, VA	R. Yoshikawa
APJ	Ridgefield, NJ	G. Chernowitz J. Ciccotti J. Arnold

DEFENSE LOGISTICS AGENCY
DEFENSE TECHNICAL INFORMATION CENTER
CAMERON STATION
ALEXANDRIA, VIRGINIA 22314

29 OCT 1981

DTIC-S

SUBJECT: Defense RDT&E On-Line System Asynchronous Dial-Up

Mr. Joe Arnold
2401 Birchett Drive
Prince George, VA 23875

Dear Mr. Arnold:

Thank you for your inquiry into the Defense RDT&E On-Line System (DROLS). DROLS, an interactive retrieval, input, and document ordering system, provides access to three data bases. The release of data from these data bases is to be used only in support of your Government contract work.

a. Research and Development Program Planning (R&DPP) Data Base - contains 1 page summaries of planned R&D project and task level summaries.

b. Research and Technology Work Unit Information System (WUIS) Data Base - contains 1 page summaries of on-going DoD research and technology efforts at the work unit level.

c. Technical Reports (TR) Data Base contains bibliographic records of technical reports submitted to DTIC.

Practically all of DTIC's collection can be searched through DROLS. The last 10 years of the TR abstracts can be fully displayed. For documents older than 10 years all fields except subject retrieval terms and abstracts are displayable. Citations to classified and unclassified reports and limited/unlimited distribution reports are available.

Most of the standard bibliographic items such as author, source (organizations), report date, title (through a title key), and subjects are searchable. Free-text searching of the narrative fields is available on a limited basis. For some data bases, nonbibliographic data is also searchable as project numbers, contact, and funding sources.

DROLS will communicate with any terminal (CRT or typewriter) which employs the standard ASCII asynchronous protocol. Terminal communications speeds will be at 300 or 1200 baud (30 or 120 characters per second) in even parity. Access may be gained by using the TYMNET commercial data communications network, FTS, WATS, or Direct Dial.

There will be a charge of $20.00 per connect hour or proportionate share. Subscribers to this service must have a deposit account with the National Technical Information Service. This account will be used for billing purposes based on connect time.

Although only unclassified information will be displayed, DoD regulations require that only contractor employees cleared to Confidential under the provisions of a Governmental contractor security program may be authorized to operate remote terminals or have uncontrolled access to systems terminals. In addition, the organization must have a Confidential facility clearance. Questions pertaining to personnel and facility clearances should be referred to your security office. Procedures outlined in the Industrial Security Regulation, DoD 5220.22-R, apply. Appendix B of the regulation which provides information regarding cognizant security offices is provided for your information (Enclosure 1).

Enclosure 2 is a DTIC policy/information sheet on the dial-up capability of the DROLS. If you wish to gain access, complete Enclosure 3 and forward a written request to DTIC. Written certification of clearance must be provided by your security office for each terminal operator before the terminal will be activated.

When your request is received, DTIC will contact you regarding a training session, provide a dial-up telephone number, site identification and "Password." Once provided, control of this information is the responsibility of the user.

Any questions should be directed to the On-Line Support Office at Area Code 202-274-7709 or AUTOVON 234-7709.

Sincerely,

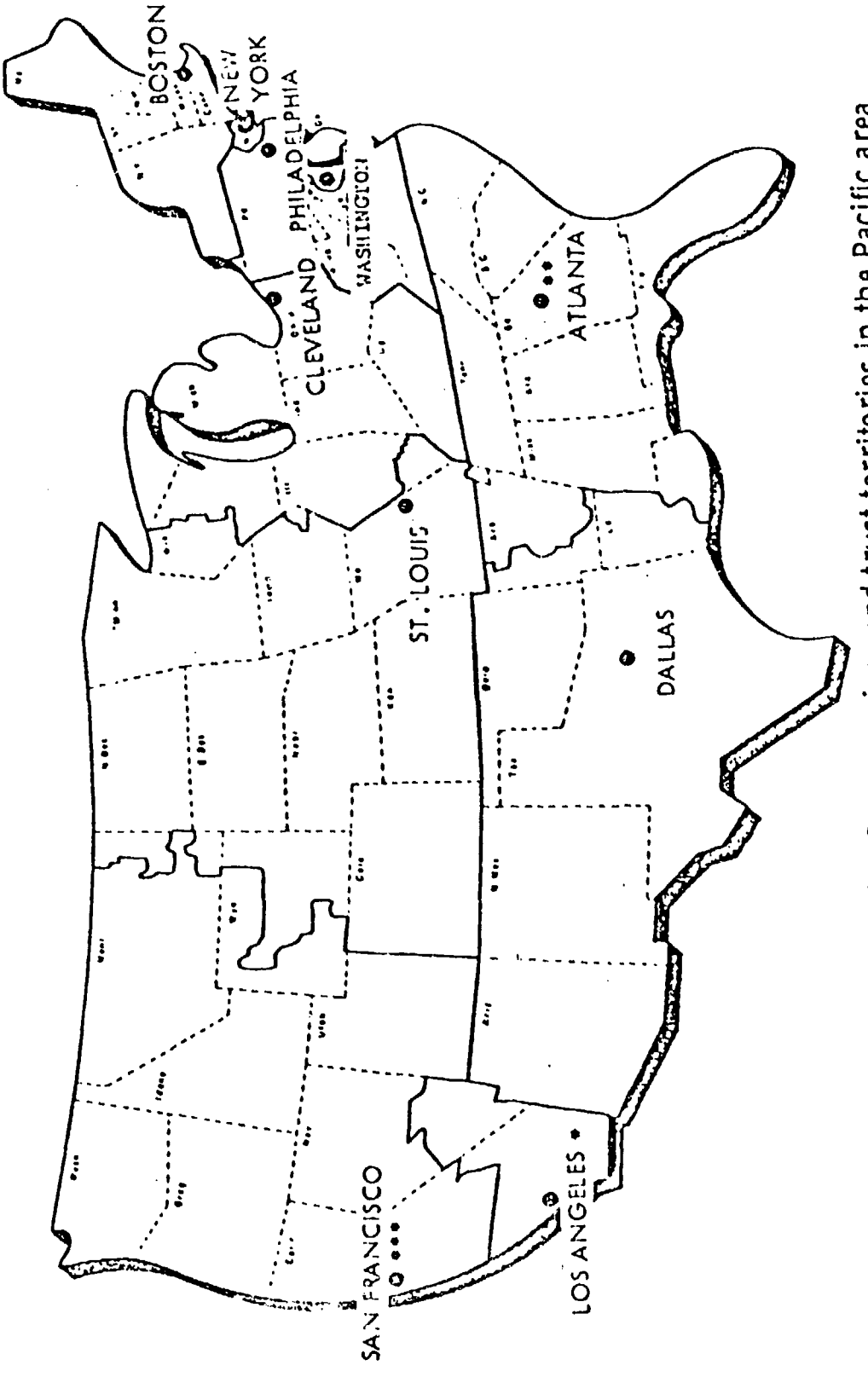
Jerry B. Milstead

3 Encl

JERRY B. MILSTEAD
On-Line Support
Management Support Office

Appendix B. INFORMATION REGARDING COGNIZANT SECURITY OFFICES, DISCO, DISI AND OISI

COGNIZANT SECURITY OFFICE BOUNDARIES



•Includes Hawaii and U.S. possessions and trust territories in the Pacific area

••Includes Puerto Rico and U.S. possessions in the Atlantic and Caribbean areas

•••Includes Aiaska

OPERATIONAL AREAS OF DIS COGNIZANT SECURITY OFFICES

ATLANTA

States of: North Carolina, South Carolina, Georgia, Tennessee, Mississippi, Alabama, Florida, Kunkin and Pemiscot counties in Missouri, — also includes Puerto Rico and U.S. possessions in the Atlantic and Caribbbean areas, and the following counties in Arkansas:

Arkansas	Jackson
Baxter	Jefferson
Boone	Lawrence
Bradley	Lee
Calhoun	Lincoln
Clay	Lonoke
Cleburne	Marion
Cleveland	Mississippi
Conway	Monroe
Craighead	Newton
Crittenden	Perry
Cross	Phillips
Dallas	Poinsett
Deska	Prairie
Drew	Pulaski
Faulkner	Randolf
Fulton	Saint Francis
Garland	Saline
Grant	Searcy
Greene	Sharp
Hot Springs	Stone
Independence	Van Buren
Izard	White
	Woodruff

The following counties in Louisiana:

Ascension	Saint Charles
Assumption	Saint Helena
East Baton Rouge	Saint James
East Feliciana	Saint John the Baptist
Iberia	Saint Martin
Iberville	Saint Mary (and part of Saint Martin)
Jefferson	
Lafayette	Saint Tammany
LaFourche	Tangipahoa
Livingston	Terrebonne
Orleans	Vermilion
Plaquemines	Washington
Pointe Coupee	West Baton Rouge
Saint Bernard	West Feliciana

BOSTON

States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, and the following counties in New York:

Albany	Columbia
Allegany	Cortland
Broome	Delaware
Cattarangus	Dutchess
Cayuga	Erie
*Chautaugua	Essex
Chemung	Franklin
Chenango	Fulton
Clinton	Genesee
Greene	Saratoga
Hamilton	Schenectady
Herkimer	Schoharie
Jefferson	Schuyler
Lewis	Seneca
Livingston	Steuben
Madison	Sullivan
Monroe	Tioga
Montgomery	Tompkins
Niagara	Ulster
Oneida	Warren
Onondaga	Washington
Ontario	Wayne
Orleans	Wyoming
Oswego	Yates
Otsego	
Rensslaer	
Saint Lawrence	

WASHINGTON

The counties of Harford, Baltimore, Howard, Anne Arundel, Montgomery, Prince Georges, Calvert, Saint Marys and Charles in Maryland, and the counties of Loudoun, Fairfax, Prince William, Arlington, in Virginia, and Washington, D.C., and the city of Alexandria, Va.

CLEVELAND

States of Ohio, Kentucky, Indiana, Michigan, and the counties of Marshall, Ohio, Brooke and Hancock in West Virginia, and the counties of Jackson, Clinton, Scott, and Muscatine in Iowa, and the following counties in Wisconsin:

Adams	Marathon
Ashland	Marinette
Brown	Marquette
Calumet	Menominee
Clark	Monroe
Columbia	Oconto
Crawford	Oneida
Dane	Outgamie
Dodge	Ozaukee
Door	Portage
Florence	Price
Forest	Racine
FondduLac	Richland
Grant	Rock
Green	Sauk
Green Lake	Shawano
Iron	Sheboygan
Iowa	Taylor
Juneau	Vernon
Kewaunee	Vilas
Kenosha	Walworth
LaCrosse	Washington
Lafayette	Waukesha
Langlade	Waupaca
Lincoln	Waushara
Manitowoc	Winnebago
Milwaukee	Wood

The following counties in Illinois:

Adams	Effingham
Boone	Ford
Brown	Fulton
Bureau	Grundy
Carroll	Hancock
Cass	Henderson
Champaign	Henry
Christian	Iroquois
Clark	Jasper
Coles	Jo Daviess
Cook	Kane
Crawford	Kankakee
Cumberland	Kendall
DeKalb	Knox
DeWitt	Lake
Douglas	La Salle
DuPage	Lee
Edgar	Livingston
Logan	Putnam
Macon	Rock Island
Marshall	Sangamon
Mason	Schuyler
McDonough	Scott
McHenry	Shelby
McLean	Stark
Menard	Stephenson
Mercer	Tazewell
Morgan	Vermillion
Moultrie	Warren
Ogle	Whiteside
Peoria	Will
Piatt	Winnebago
Pike	Woodford

DALLAS

States of: New Mexico, Texas, Oklahoma, Arizona, and the following counties in Arkansas:

Benton	Miller
Caroll	Montgomery
Clark	Nevada
Columbia	Ouachita
Crawford	Pike
Franklin	Polk
Hempstead	Pope
Howard	Scott
Johnson	Sebastian
Layfayette	Sevier
Little River	Union
Logan	Washington
Madison	Yell

The following counties in Louisiana:

Acadia	De Soto
Allen	East Carroll
Avoyelles	Evangeline
Beauregard	Franklin
Bienville	Grant
Bossier	Jackson
Caddo	Jefferson Davis
Calcasieu	La Salle
Caldwell	Lincoln
Cameron	Madison
Catahoula	Morehouse
Claiborne	Natchitoches
Concordia	Ouachita
Rapides	Union
Red River	Vernon
Richland	Webster
Sabine	West Carroll
Saint Landry	Winn
Tensas	

LOS ANGELES

Includes state of Hawaii & U.S. possessions & trust territories in the Pacific area, and the following counties in California:

Imperial	San Bernadino
Inyo	San Diego
Kern	San Luis Obispo
Los Angeles	Santa Barbara
Orange	Ventura
Riverside	

The following counties in Nevada:

Clark	Lincoln
Esmeralda	Nye

NEW YORK

The following counties in New York:

Bronx	Putnam
Kings	Queens
(Brooklyn)	Richmond
Nassau	Rockland
New York	Suffolk
(Manhattan)	Westchester
Orange	

The following counties in New Jersey:

Bergen	Morris
Essex	Passaic
Hudson	Somerset
Hunterdon	Sussex
Middlesex	Union
Monmouth	Warren

PHILADELPHIA

States of: Pennsylvania, Delaware, West Virginia (less the counties of Marshall, Hancock, Brooke and Ohio), Virginia (less the counties of Loudoun, Fairfax, Prince William and Arlington), Maryland (less the counties of Harford, Baltimore, Howard, Anne Arundel, Montgomery, Prince Georges, Calvert, Saint Marys and Charles), Chautauqua county in New York, and the following counties in New Jersey:

Atlantic	Camden
Burlington	Cape May
Cumberland	Ocean
Gloucester	Salem
Mercer	

SAINT LOUIS

States of: N. Dakota, S. Dakota, Minnesota, Nebraska, Colorado, Kansas, Missouri (less Dunkin and Pemiscot counties), Iowa (less Jackson, Clinton, Scott and Muscatine counties), and the following counties in Wisconsin:

Barron	Burnett
Bayfield	Chippewa
Buffalo	Douglas

Dunn	Polk
Eau Claire	Rush
Jackson	Saint Croix
Pepin	Sawyer
Pierce	Trempealeau
	Washburn

The following counties in Montana:

Carter	Prairie
Daniels	Roosevelt
Dawson	Richland
McCone	Sheridan
Powder River	Wibaux

The following counties in Wyoming:

Albany	Fremont
Cambell	Goshen
Carbon	Laramie
Converse	Natrona
Crook	Niobrara
Platte	Weston

The following counties in Illinois:

Alexander	Jacks
Bond	Jefferson
Calhoun	Jersey
Clay	Johnson
Clinton	Lawrence
Edwards	Macoupin
Fayette	Madison
Franklin	Marion
Gallatin	Massac
Green	Monroe
Hamilton	Montgomery
Hardin	Perry
Pope	Union
Pulaski	Wabash
Randolph	Washington
Richland	Wayne
St. Clair	White
Saline	Williamson

SAN FRANCISCO

States of: Washington, Oregon, Idaho, Utah, Alaska, and the following counties in Wyoming:

Big Horn	Sublette
Hot Springs	Sweetwater
Johnson	Teton
Lincoln	Uinta
Park	Washakie
Sheridan	

The following counties in Montana:

Beaverhead	Broadwater
Big Horn	Carbon
Blaine	Cascade
Chauteau	Mineral
Custer	Missoula
Deer Lodge	Musselshell
Fallon	Park
Fergus	Petroleum
Flathead	Phillips
Gallatin	Pondera
Garfield	Powell
Glacier	Ravalli
Golden Valley	Rosebud
Granite	Sanders
Hill	Silver Bow
Jefferson	Stillwater
Judith Basin	Sweet Grass
Lake	Teton
Lewis and Clark	Toole
Liberty	Treasure
Lincoln	Valley
Madison	Wheatland
Meagher	Yellowstone

The following counties in Nevada:

Churchill	Lyon
Douglas	Mineral
Elko	Pershing
Eureka	Storey
Humboldt	Washoe
Lander	White Pine

The following counties in California:

Alameda	Nevada
Alpine	Placer
Amador	Plumas
Butte	Sacramento
Calaveras	San Benito
Colusa	San Francisco
Contra Costa	San Joaquin
Del Norte	San Mateo
El Dorado	Santa Clara
Fresno	Santa Cruz
Glenn	Shasta
Humboldt	Sierra
Kings	Siskiyou
Lake	Solano
Lassen	Sonoma
Madera	Stanislaus
Marin	Sutter
Mariposa	Tehama
Mendocino	Trinity
Merced	Tulare
Modoc	Tuolumne
Mono	Yolo
Monterey	Yuba
Napa	

TELEPHONE NUMBERS AND ADDRESSES

The following listing contains the addresses and telephone numbers of all Cognizant Security Offices. (The following indicated telephone numbers and addresses shall be used to obtain the required verification of facility clearance and safeguarding capability of prospective contractors and subcontractors.)

City & State	Address	Area Code	Telephone Number
Atlanta, GA	805 Walker St. Marietta, GA 30060	404	429-6340
Boston, MA 02210	666 Summer Street	617	542-6000, ext 838
Cleveland, OH 44199	Federal Office Bldg. 1240 East 9th Street	216	522-5338/9
Dallas, TX 75201	Merchandise Mart Bldg. 500 South Ervay Street	214	670-9276
Los Angeles, CA 90045	11099 S. LaCienega Blvd.	213	643-0203
New York, NY 10013	60 Hudson Street	212	374-9040
Philadelphia, PA 19101	P.O. Box 7478 2800 South 20th Street	215	952-4030
San Francisco, CA 94129	Presidio of San Francisco	415	561-6235
St. Louis, MO 63101	1136 Washington Street	314	263-6581
Washington, D.C. (Capital Region)	2461 Eisenhower Ave. Alexandria, VA 22331	202	325-9616

Cognizant Security Office	Area Code	Telephone Number	AUTOVON NO. (For Govt. Agencies Use)
Atlanta	404	429-6340	697-6340
Boston	617	542-6000, ext. 805	955-8805
Cleveland	216	522-5334	580-5334
Dallas	214	670-9270	940-1270
Los Angeles	213	643-1082	833-1082
New York	212	374-9040	994-9046
Philadelphia	215	952-4030	444-4030
San Francisco	415	561-3572	586-6235
St. Louis	314	263-6580	693-6580
Washington (Capital Region)	202	325-9161	221-9616

The following listing contains the addresses and telephone numbers of DISCO, DISI and OISI.

City & State	Address	Area Code	Telephone Number
DISCO, Columbus, OH 43216	P.O. Box 2499	614	236-2133 (Duty Hrs)
		614	236-2058 (After Hrs)
	AUTOVON NUMBER (For Govt. Agencies Use)		850-2133 (Duty Hrs)
DISI, Richmond, VA 23297	c/o Defense General Supply Center	804	275-4891
	AUTOVON NUMBER (For Govt. Agencies Use)		695-4891
OISI, Brussels, Belgium	Physical Address: Office of Industrial Security, International Chaussee de Louvain, 13 1940 St. Stevens, Woluwe, Belgium		Brussels, Belgium 720-8259
	Mailing Address: Office of Industrial Security, International APO New York 09667		

ASYNCHRONOUS DIAL-UP POLICY/INFORMATION

I. User Charges

a. All dial-up users will pay $20 per connect hour.

b. All dial-up users must have a NTIS Deposit Account.

c. No charge for batch printing.

d. No charge for time spent on input.

e. No charge to users for use of TYMNET Communications Network.

f. No charge for training.

II. Training

a. Those using asynchronous terminals for access will be trained at DTIC.

b. Training will be for 3 days.

c. Requests for training at remote sites will be considered on a case-by-case basis. The decision will be based on the number of users to be trained, availability of a training site and terminals, and the availability of DTIC training personnel.

d. Training classes will be limited to a maximum of 10 people. (One person per site unless room is available).

e. No users will be added without at least one operator being trained at DTIC. If a dial-up, asynchronous user has had experience with a commercial system such as Dialog or Orbit, they may be added without attending a DTIC training session with the approval of the DTIC On-Line Support Office (DTIC-SM).

f. Usage of the system by dial-up users will be closely monitored to assure equitable distribution of dial-up facilities.

g. One copy of the reference tools will be provided to each site free of charge; any additional copies would have to be purchased.

Encl 2

III. Each site will be given a unique "Password" which will be changed quarterly or as required. Initially, multiple terminals at the same site will be given the same password.

IV. Credit for down time will be given when a user feels that credit is due and applies to the DTIC On-Line Support Office (DTIC-SM) in each instance.

V. The size of bibliographies batched will be limited to 200 citations. If a larger output is needed, users will contact the On-Line Support Office (DTIC-SM), Area Code 202 274-7709 or AUTOVON 284-7709, who will arrange to have the searches run by DTIC personnel.

VI. All contractor employees operating or having uncontrolled access to terminals must be cleared through Confidential under a Government contractor security program.

VII. All contractor facilities must have a Confidential facility clearance.

POINT OF CONTACT:

Name _____

Telephone Number _____

COMPLETE MAILING ADDRESS:

_____

_____

_____

_____

Operational Hours _____

DTIC User Code _____

NTIS Deposit Account Number _____

Which communications method do you plan to use to access DROLS via:

a. TYMNET
b. FTS
c. WATS
d. Direct Dial

Terminal Type/Model _____

CRT or Teleprinter _____

Printer Type/Model (Optional) _____

Asynchronous transmission speed you wish to operate at:

a. _____300
b. _____1200

Modem Type/Model _____

Encl 3

TERMINAL LOCATION:

Military Installation ____ Yes ____ No
Commercial Building ____ Yes ____ No

Address of terminal location (include building name or number, room number, city, state and zip code).

_____

_____

_____

_____

_____

NAMES OF ALL TERMINAL OPERATORS:

_____

_____

_____

_____

GLOSSARY

ACO	Alternative Concept of Operation
ADP	Automatic Data Processing
ADPE	Automatic Data Processing Equipment
ADS	Automated Data Systems
ALDT	Administrative and Logistic Downtime
A_o	Operational Availability
ARA	Assigned Responsible Agency
COEA	Cost and Operational Effectiveness Analysis
COMRAM	Common RAM System
CPU	Control Processing Unit
CRT	Cathode Ray Tube
CTDCS	Common Test Data Collection System
CTP	Coordinated Test Program
DBMS	Data Base Management System
DFSR	Detailed Functional System Requirements
DLSIE	Defense Logistics Services Information Exchange
DPFO	Data Processing Field Office
DROLS	Defense RDT&E On-Line System
DT	Development Test
DTIC	Defense Technical Information Center
EEA	Essential Elements of Analysis
EEI	Essential Elements of Information
FD	Functional Description
FP	Functional Proponent
FSR	Final Study Report
FTS	Federal Telephone Service
LOA	Letters of Agreement
LSAR	Logistics Support Analysis Report
MMLA	Maintenance Manpower & Logistics Analysis
MP	Management Plan
MR	Maintenance Ratio
MRSA	Materiel Readiness Support Activity
MTBF	Mean Time between Failure
MTBOMF	Mean Time between Operational Mission Failure
MTBUMA	Mean Time between Unscheduled Maintenance Actions
MTTR	Mean Time to Repair
NBC	Nuclear, Biological, Chemical

GLOSSARY (Concluded)

OAD	Operational Analysis Directorate
OT	Operational Test
OTEA	Operational Test & Evaluation Agency
PA	Proponent Agent
PFDB	Planning Factors Data Base
PFMD	Planning Factors Management Division
RAM	Reliability, Availability, Maintainability
ROC	Required Operational Capability
SAG	Study Advisory Group
SAMS	Standard Army Maintenance System
SDC	Sample Data Collection
SDP	System Decision Paper
SOW	Statement of Work
SRD	System Requirements Description
STP	System Technical Paper
SWP	Study Work Plan
TDLR	Training Device Letter Requirements
TMIS	Test Management Information System
TRADES	TRADOC RAM Data Evaluation System
TSM	TRADOC System Manager